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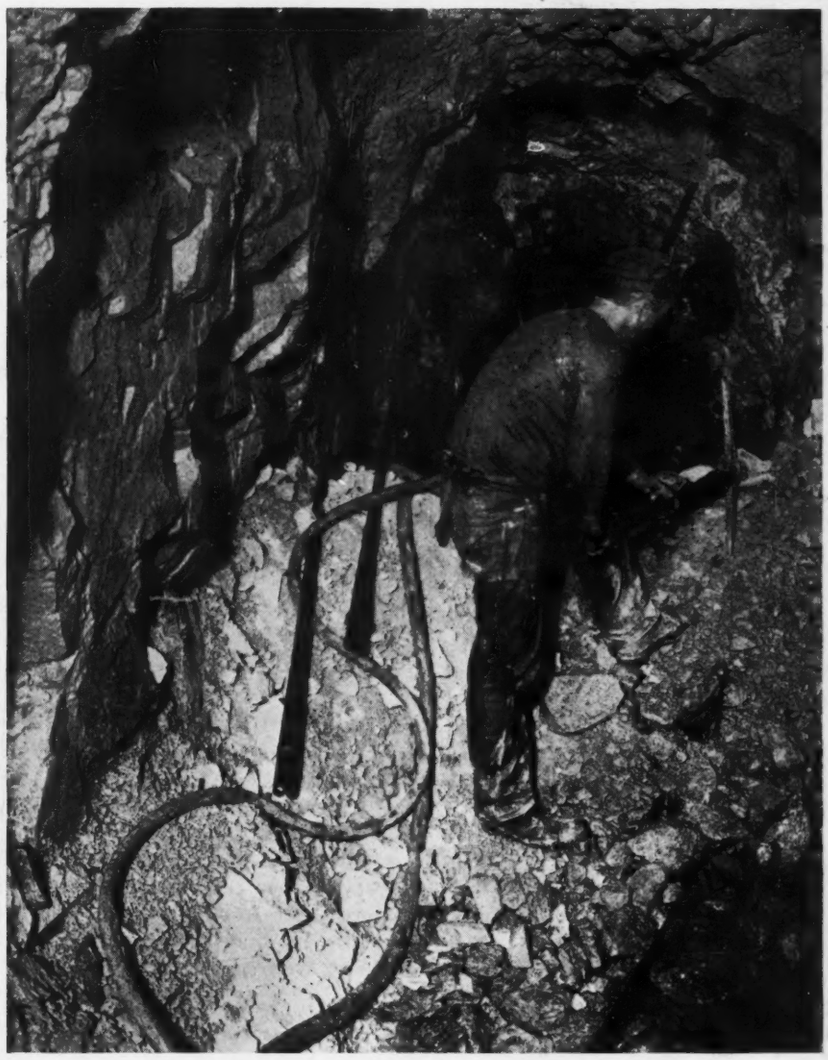

At the face of the drift.
The mucker and the miner.
Calumet and Hecla Copper Mine,
Calumet, Mich.

The Silver Market — By C. W. Wheelock

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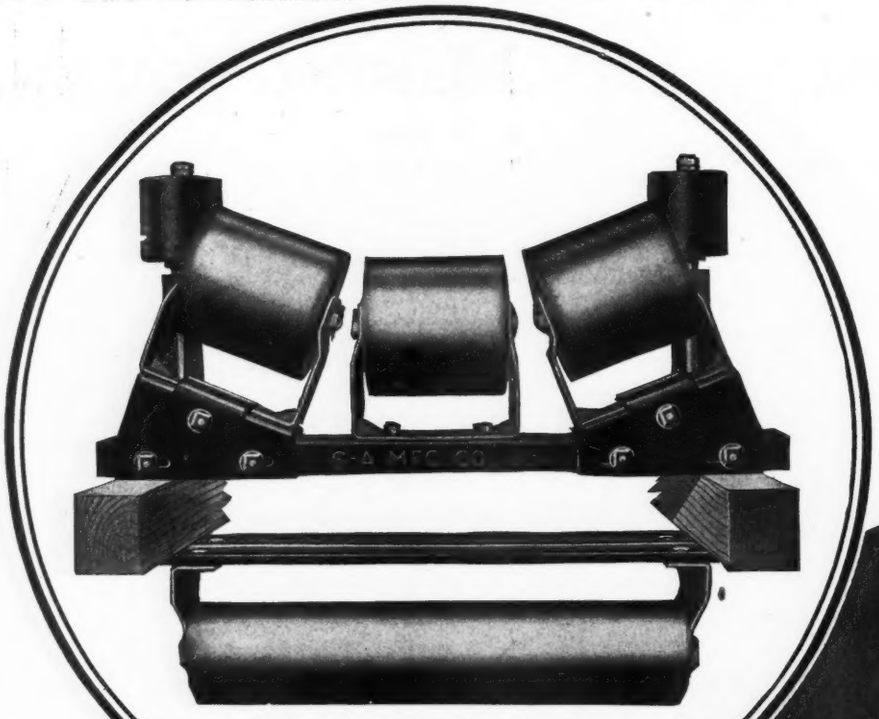
Alteration in a Ventilation Shaft — By J. H. Stovel

Sketch of Robert Peele — Mining Engineer



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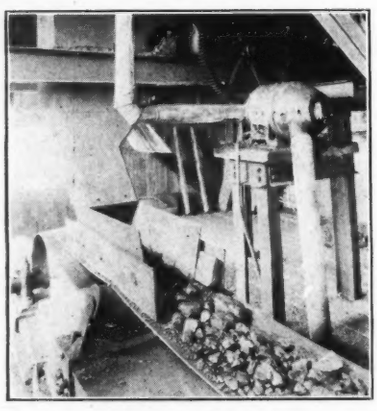

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries
METALS NON-METALS PETROLEUM

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Volume 111 **New York, January 15, 1921** *Number* 3

Postponing Assessment Work

IN THE last hours of the old year Congress passed the bill giving six months' extension to miners for doing the annual assessment work necessary for holding their claims. Just previous to its passage Senator Thomas, of Colorado, remarked that if the bill did not pass he would be quite reconciled to the fact, as he had been receiving so many letters and telegrams from miners in his state, protesting against its passage.

We have never advocated this measure, and such comment as we have received from the mining states of the West has been uniformly unfavorable to it. It appears to be a statute designed to win the favor of a certain group of citizens, without cost to the country, but the proponents erred in the failure to reflect and to investigate. During the war the obligation of the annual assessment work was properly postponed on account of the fact that a large number of claim holders were in the service; and later the principle was extended because of the difficulty of obtaining labor. None of these reasons excuse the most recent legislation. The soldiers are long since back on their jobs; and for the last few months unemployment has been growing in a most alarming way. There have been plenty of men eager to do the $100 worth of work necessary to hold a claim; but the claim owners, as one correspondent put it for his section of Nevada, were glad to save the money and spend the winter in California on it. Therefore, this foolish legislation served to aggravate the present unemployment evil.

But the crowning stupidity, as a Colorado correspondent points out, was to pass the bill in the last hours of 1920, when all miners, prospectors and other owners of mining claims, who thought enough of their claims to hold them, had already faithfully carried out the assessment work required by the law. Such law-abiding and hard-working individuals (and they are in the majority) look with no favor upon the Government pull which assisted the gamblers in mining claims, who would not think of spending any money in developing them, but who rely upon Congress, or some subterfuge, to keep them in possession of Government land without labor or expense.

Present Misery and Future Hopes

TURNING to the misfortunes of others is one way, though a poor one, to alleviate one's own troubles. Those of us engaged in the mining industry feel that we are suffering unduly, but we are no worse off than most other basic industries the values of whose products have fallen below their production costs. How would you like to be in the rubber business, for example, with present prices 19c. per lb., compared with 63c. in the spring of 1914 and practically no profitable war inflation? All producers and manufacturers are affected by present conditions, and the metal industry is no worse off than some others are.

The future in decidedly indefinite. With each drop in copper we try to think the bottom has been reached; and each time we are disappointed. Until copper is shipped abroad in much greater quantities than at present, an improvement is unlikely. Large stocks, estimated at close to one billion pounds, are hanging heavy over the market. Some people, both abroad and at home, seem to derive considerable pleasure from criticizing the policy which permitted the piling up of these stocks. The hindsight of these critics is excellent—would that it could be put to profitable use! The fact is simply that the copper producers made as intelligent a guess as was possible in this muddled world—and guessed wrong. Why blame them now? After all, they are the best copper producers that we have.

Fortunately, other metals are not troubled with the bugbear which faces copper, but still it is too much to expect prices to advance greatly for six months at least. It looks as if about the best we can hope for is a reduction in wages, fuel and necessary supplies which will permit us to get along even though prices are low. Students of business conditions, however, expect a pronounced improvement in the early fall.

Lodes and the Law I Sing

WHEN things get dull in the mining fraternity, when mines shut down, and the mills stop grinding, and no sales are reported in the copper market, it will always be possible to set off a few fireworks by criticizing the really positively abominable system which has been devised to decide the apex law problems. Our amateur editorial in the issue of Nov. 18 has borne fruit manifold. We have to thank Mr. Horace Winchell for a satisfying citing of authorities, from Von Cotta down, to prove that a bed or stratum may be a lode. This is entirely unnecessary, so far as we are concerned. Were we inclined to look for further authority in this matter, we should prefer Mr. Winchell's say-so to any that he has cited.

They are dreadfully acute, these apex geologists. Mr. Winchell nails us to the wall for a phrase "the quartzites which lie between the limestone." Very bad, of course: we shall speak to the proofreader about it. Mr. Reno H. Sales, in a letter which we publish in another column, is bursting with the discovery that we used the phrase "the junction of the vertical veins with the limestone," which, it appears, is a solecism in Butte. He refers to this (we suspect sarcastically) as a "newly discovered geological phenomenon"; and this phenomenon he defines as "a case where a vertical vein cuts a limestone and at the same time forms a junction with it." We are confused about this, and are glad we are not on the witness stand. We realize that we must have "made

a break," but will somebody whisper us the answer? "Is it any wonder," he says, "that it cost two mining companies over half a million dollars, trying to make the geology in the case clear?" Oh, no, indeedy—say, who got the half million?

Mr. Winchell and Mr. Sales, and Mr. Robinson in his courteous letter which we published Dec. 25, all assume that the final decision to which we all bow is a court decision. But we were not discussing the matter with the lawyer's mind and standards, but those of the geologist and engineer. Equity, not decisions; common-sense, not argument; what should be, not what is and has been. The very fact that we criticized at all should have made this clear to them. And, therefore, the case cited by Mr. Sales where the view was "upheld by the court" that a body of unmineralized quartzite 200 to 500 ft. thick, with the sky for a hanging wall, was a lode, appeals to us as probably also very messy, although we know only what he tells us about it.

The general case for apex litigation, from our viewpoint, is put in a private letter from a distinguished engineer, whose name we have not the authority to state:

"I agree with you—a bed of limestone that happens to be the locus of increased mineralization is not a vein. Would it be a vein a hundred miles away from the mineralization? If you don't look at it from a geological point of view, how *are* you to look at it? Is a vein to be merely what you can persuade a court to say it is? On the other hand, I have always felt that intelligent men should not refrain from trying to make the best they can out of the apex law. Stupid men certainly would do no better. But I have never liked the idea of a man surrendering his independent and detached judgment to the claims of partisanship. In these apex cases, it is almost impossible to avoid becoming a partisan and a special pleader. That is not only my observation but my experience. That is not a candid attitude toward the truth. The pursuit of the truth is not just scientific exaltation; it is practical common sense—the process of getting things right."

Ownership of American Smelting & Refining Co.

THE Eilers-Guggenheim controversy concerning the management of the affairs of the American Smelting & Refining Co. is interesting and enlightening, at least in the partial list of stockholders of the company taken on the same date (April 1) in 1919 and 1920, which Mr. Eilers has presented. This will be a shock to common understanding and tradition. The miner who sells his ore to the A. S. & R. smelters, and kicks about the smelter charges, sometimes pictures the members of the Guggenheim family as taking a tribute on his labor and enterprise, and maintaining themselves in luxury therefrom. The public who hears about the "smelter trust" and the journals that quote the "trust price" for lead, doubtless visualize this great mining and smelting organization as in the main owned and controlled by the celebrated family of financiers.

Certainly, Mr. Eilers' revelations are as rude as those of the boy who in our tender years informed us that there was no Santa Claus, so woven into the web of our lives and economic theories is the time-honored conception. To be informed that Mr. Daniel Guggenheim owned on the dates mentioned only one hundred shares of common stock, value now three or four thousand dollars, is cruel; and that Mr. Isaac Guggenheim controlled on April 1, 1919, to the extent of one share of preferred stock, to the present value of eighty dollars! Surely any one of our readers can attain the same proud position, and any little group of them can, if they wish, control more shares than the number given for the whole Guggenheim family.

And the same thing is true of all the other directors and officers of the company. Mr. Eilers and his family made by far the largest showing in his entire list, but even the Eilers' holdings of something more than three thousand shares of preferred stock are only a tiny fraction of the shares of stock outstanding, and the total amount which he gives as owned by the entire list of officers is relatively negligible.

Again, what a surprise it will be to those who believe that the smelters, by virtue of their multiplicity and their organization, are enabled to profiteer on the miner, to find that the rake-off has not been sufficient to induce the Guggenheims to put much of their own money in the enterprise—with the corollary that they can make more profitable use of their capital elsewhere!

Who is it, then, that owns the great smelting company, and to whose pockets come its profits? Apparently, the general investor, the public; almost, we were tempted to state, the Common Peepul. These draw the 7 per cent on their holdings of preferred stock and 4 per cent on the common, and pray for the stock market to rise, so that they can sell out at a profit.

It must be added, however, to the picture as presented by Mr. Eilers, that according to the later statement of Mr. Newhouse, chairman of the board of directors of the company, in reply to Mr. Eilers, the present holdings of the Guggenheim family are far larger than they are shown in Mr. Eilers' statement, which he gives only for the two dates mentioned. According to Mr. Newhouse, their holdings of common and preferred stock amount to over 36,000 shares, and the total of over 28,000 shares of this amount, held by Mr. Simon Guggenheim, makes him the largest single stockholder in the company. Thirty-six thousand shares represents, of course, a tidy little fortune, but is not relatively of much consequence in a total amount outstanding of 1,110,000 shares—a little over 3 per cent; and incidentally, it probably represents far less than 1 per cent of the total wealth of the family—so that our reflections as to the real ownership of the smelting company remain.

Lenine and Vanderlip

THAT our diagnosis of the Washington B. Vanderlip incident in our editorial of Dec. 25 was correct has been confirmed by no less an authority than Lenine himself. The Bolshevik Premier's speech, before the convention of the Communist party recently held in Moscow, has been reported in full in the official Bolshevik *Krasnaya Gazetta*, and from there to our daily press:

"Our granting of concessions to the American millionaires will serve to make relations between Japan and America more strained," said Lenine. "There is already talk in Japan that Russia is driving it to war with America. We shall utilize their conflict for our own interests. By signing concession agreements with the bourgeoisie we gain a moral as well as material victory."

Also, Lenine remarked that "the world revolution, by whose aid alone we can win, does not mature at the speed we hoped for in the beginning." Hence, the necessity of little diplomatic moves, and the subsidizing of propagandists like Vanderlip!

WHAT OTHERS THINK

Cost of Copper in 1921

I was attracted by your general review entitled "Curtailment in the Copper Industry" appearing on p. 1154 of your issue for Dec. 11, 1920. At that place you noted Mr. Finlay's estimate that in 1910 no copper could be produced in North America at a profit for less than 10c. per lb., then left the reader to infer what must be the plight of the industry at present with copper at 13c.

Permit me to suggest that you have not laid enough emphasis upon improvements in technology as a means of reducing costs, in spite of decreasing ore-tenor and increasing prices for labor and materials. It is the pride of all thoughtful engineers who have been engaged in the copper industry that they and the business men behind them have at no time been content to settle back in their easy chairs and contemplate the art of getting copper as a thing of perfection. Mr. Finlay's remarks to the effect that 10c. represents the cheapest copper, 11c. cuts off half the production, and 12c. would barely cover costs of most of the copper are as applicable to 1900 and even to 1890 as they are to 1910. And remember that in 1890 "first-class ore" meant what "matte" means now; concentrating ore carried from 7 to 10 per cent copper; millmen were receiving 25c. per hour and Bradstreet's index of prices for wholesale commodities was about 8!

When viewing the honorable history of the engineer engaged in copper mining and metallurgy, it involves no great strain upon the credulity to state that Mr. Finlay's remarks will still hold, if not for 1920 despite its 1 per cent concentrating ore and Bradstreet's index of 19, then for some time in the not distant future.

It may be remarked, however, that it is unnecessary to estimate across a lapse of ten years, in arriving at an idea of the present cost of copper. You are undoubtedly familiar with the fact that the Federal Trade Commission has published a pamphlet on the cost of copper in 1918, based on uniform reports covering 95½ per cent of the total United States production for twelve months. In view of the comprehensiveness of this inquiry, and its undoubted accuracy, it seems that it may form the basis of a more definite estimate of the condition among copper producers.

In scaling down from the 1918 estimates, however, it may be questioned whether 1918 actually represented the peak of the cost of copper. It was the last war year, labor was scarce and independent, and commodities were very high. Yet production was at a high rate of speed, and has recently been at a much lower rate.

We may examine the quarterly reports of Utah Copper Co. for information on this head, and secure the following tabulation. (Cost is less miscellaneous credits, and does not include Federal income and profits taxes.)

Period	Cost, Cents	Tenor of Ore, Per Cent	Per Cent Extraction	Monthly Production, Pounds
Year 1918	12.53	1.23	65	15,700,000
Year 1919	12.37	1.26	78.5	8,700,000
Jan.-June, 1920	11.50	1.22	84.5	8,900,000

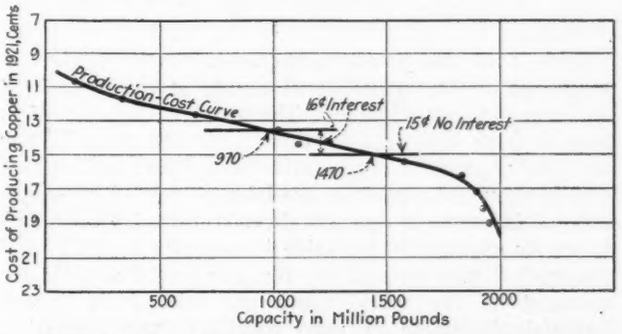
Increase in extraction and other economies have evidently kept down the costs despite low output. If Utah Copper may be taken as a representative, it is safe to assume that 1918 saw the peak of copper costs.

According to the Federal Trade Commission's report, the weighted average cost of all American copper in 1918 was:

	Cents per Lb.
Labor	$0.0531
Materials and supplies	.0376
Overhead	.0214
Depreciation	.0094
Depletion	.0072
Tolls	.0500
Total	$0.1787
Less credits	.0171
Net cost	$0.1616

This is exclusive only of interest, and Federal excess-profits and income taxes.

In making a prediction as to the cost of copper in 1921, these items may be considered separately.



ESTIMATED COST OF PRODUCING COPPER IN 1921

Labor has already shown an increase in efficiency of at least 10 per cent, and wage decreases averaging at least 15 per cent will be in effect early in 1921. Cost of labor in 1921 will certainly be no higher than 4.10c. per lb. copper.

Bradstreet's index value for wholesale commodities averaged 18.7117 in 1918, whereas in December, 1920, it stood at 13.6263. However, it is unfair to use these figures as they stand. Coal and coke are used in large tonnage in getting copper. They have increased in price since 1918 rather than decreased. On the other hand, timber and locally obtained supplies will decrease roughly proportional to the decrease in labor costs. A great deal of fuel and power comes in this category. On the whole, it may be approximately correct to figure "Materials and Supplies" used in getting copper in 1921 to an index number of 16, which reduces the value to 3.22c. per lb. copper.

Overhead tends to go up with decreasing production. However, it should be noted that the low-cost producers quote low values for overhead—and they are the only ones who will operate in 1921. Every effort will be made to keep down overhead, and it undoubtedly will be no higher than in 1918.

Depreciation depends upon value of the investment and its use. If it were figured entirely upon investment, the amount per pound of copper would vary inversely as the output; if entirely upon the use of the equipment, the amount per pound of copper would remain stationary. A happy balance is necessary. It should

also be remembered that 1918 was a good year to charge heavy sums to depreciation, both on account of short-lived rush construction, and the excess-profits tax. It is thought that this item will not increase in 1921 to much more than 1c. per lb. of copper.

Depletion is a fixed charge against a pound of copper.

Tolls will naturally decrease, as the labor and materials required to perform such service will decrease. However, this may be balanced by increase in freight rates, so let the value remain unchanged.

Credits, largely due to sales of byproduct silver, will decrease. In 1918 the price of silver was 97c. per oz.; if it be assumed to be 70c. in 1919, the amount of credit figures to 1.23c. per lb. of copper.

For the above reasons it appears that the average cost of copper in 1921 for all the producers reporting in 1918 will be conservatively:

Labor	$0.0410
Materials and supplies	.0322
Overhead	.0214
Depreciation	.0100
Depletion	.0072
Tolls	.0500
	$0.1618
Less credits	.0123
Net cost	$0.1495

This represents a decrease of 7½ per cent from that of 1918.

Table I of the Trade Commission's report gives a tabulation of the quantities of copper produced in 1918 at different rates per pound. The graph curve on p. 91 is derived from this data by decreasing the costs 7½ per cent, and plotting the cumulative quantities; and may be used to show the capacities available at any selling price. From this curve it appears directly that 1,470,000,000 lb. yearly capacity is available in America in 1921, and the product may be sold for 15c. per pound at Atlantic seaboard, if the stockholders are willing to forego dividends in order to keep together their operating forces and to remain as a going concern. And 970,000,000 lb. of that copper can be got at a cost which, if sold for 15c., would pay 6 per cent interest on the investment (27c. invested for each pound yearly capacity).

The year 1921 will doubtless be a lean one for dividends from coppers (and lean ones usually follow fat ones), but there seems no likelihood that the industry will die of starvation. The combined incidence of lower labor and commodities and improved organization, mining, and metallurgy should set the market on a new and stable foundation.

E. E. THUM.

New York, N. Y.

Ouija and the Water Witch

It sounds like the title of a fairy tale, doesn't it? And some of the stories of water witching are just as interesting as a fairy tale—and just as true. Having had some experience in the study of underground waters, I have been much interested in the articles on divining rods that have appeared recently in *Engineering and Mining Journal*.

J. H. Eby's article, "The Forked Stick and Structural Geology," in the issue of Dec. 11, is of particular interest as being the first instance that I have seen of an attempt to correlate the revelations of the divining rod with scientific deductions. I agree with Mr. Eby that "there are more things in heaven and earth than engineers have ever dreamt of," and I confess to having felt some mysticism at times over instances I have known of manifestations of the divining rod and to have wondered if possibly there was something to the use of this instrument.

A Swiss has invented a so-called water finder that works on the principle of a galvanometer and is based on a theory that magnetic lines of force follow underground water strata. In Norway, Hertzian waves have been used in locating orebodies. An instrument projects waves into the ground, which, on coming in contact with a metallic orebody, are reflected. A receiving instrument is moved about until it intercepts the reflected rays, and the position of the orebody is calculated from the distance between the two instruments and the angle at which the rays were projected into the ground. This is a demonstrated phenomenon and is scarcely more than a step beyond the dipping needle, the practicability of which is unquestioned. Assuming that such lines of force exist as are claimed in connection with the water finder, can it be that there are some human bodies that are sensitive to them, as the galvanometer responds to an induced current? Personally, I think not, but "there are more things," etc.

The psychological theory is the reasonable one, and water witching can properly be classed with table tipping and the workings of the ouija board. Mr. Eby makes something of a point of the fact that the forked stick would not work when he wanted it to, and vice versa, but that confirms the theory rather than disproves it, as the forked stick works under the direction of the subjective and not the objective mind. Have not all of us resolutely asserted to ourselves that such and such a thing was so when back in our minds an insistent small voice told us that it wasn't? It is of such stuff that hunches are made, and the hunch is now a recognized scientific fact. Likewise, the intuition of woman, which is no longer considered the joke that it was a generation ago.

Being of a somewhat matter-of-fact disposition, I never could get any "kick" out of the forked stick, but I have had some success with the ouija board, and I quite well remember a friendship which, some years ago, was rapidly progressing beyond the "warm" stage, but which reached an abrupt termination when Ouija insisted on making some embarrassing revelations not only contrary to my will but also to my efforts. Many of us have witnessed the phenomenon of "table tipping." I have seen such a demonstration when four men were powerless to keep the table on the floor, so quite evidently it is not the conscious mind that controls in these manifestations.

Naturally the question arises, "How did Mr. Eby as a fourteen-year-old boy locate conditions that were beyond his knowledge at that time?" The logical answer is to be found in either telepathy or heredity, or both. He tells us that he had an elementary knowledge of geology, and it is entirely within the range of demonstrated phenomena that his mind might have been guided by an inherited knowledge not yet brought to the surface, or by the knowledge of someone else who was familiar with the geological conditions. If the latter, such knowledge might have been communicated wholly unconsciously to both parties or even between persons unknown to each other.

The most wonderful thing that Nature ever created, and the one of which we know the least, despite our boasted scientific progress, is the human mind. Beside

it, such subjects as water witching are as the a b c's and the intricacies of geology are of the elementary grades. Its mysteries will be the last that science will unlock, and when she has done so there will be few things in heaven and earth that we have not only dreamt of, but understood. LEROY A. PALMER.

San Francisco, Cal.

Electrical Smelting in Norway

In your issue of Oct. 30, I find in an article by Matthew R. Blish, entitled "The Mining and Metallurgical Industry of Norway," under the heading "Copper Industry Suffering From High Costs," the following passage: "One company, the Sulitjelma mine, is experimenting now on an electrical method."

This is not quite correct. The electrical method used in Sulitjelma has been in actual work for several years, and is in fact past the experimental stage. Many thousand tons of ore were smelted during the war in the electrical furnace, with very good technical and economical results. At present the whole smelting plant in Sulitjelma is shut down; not on account of inefficiency of the methods used, but because the high price of sulphur in the ore, in connection with the high wages and other operating charges, makes it more profitable for the company to sell the sulphur to the sulphuric-acid producers, wood-pulp factories, and other users of the material.

The "Westly electric smelting method" is patented in most countries. The company owning the method has its office in Solligaten 1, Kristiania, Norway, and will be glad to give all further information.

Kristiania, Norway. HOLM HOLMSEN.

The McFadden Bill

In a circular entitled "The Industrial Gold Consumers' Subsidy," issued from the headquarters of the American Mining Congress, at Washington, D. C., Mr. H. N. Lawrie, "chief, precious metals division," argues in favor of the McFadden Bill. He begins by stating "There are 480 grains in an ounce of gold." In this he is correct, because the weight of gold is properly expressed in troy ounces. Continuing, he states, "By United States statute there are 23.22 grains of fine gold in the standard dollar." This statement is also correct. Still continuing, he says: "Dividing the number of grains in an ounce" (troy) "by the number of grains in a dollar, the quotient obtained is 20.6718 dollars"; and that is correct, too. But he adds that 20.6718 dollars is "the price of the fine gold ounce."

It seems reasonable to ask just here, wotinell, or elsewhere, does he mean by "the price of the fine gold ounce"? It is axiomatic that things which are equal to the same thing are equal to each other. Therefore, if an ounce of fine gold is 20.6718 dollars, and if 20.6718 dollars is the price of a fine gold ounce, then the price of a fine gold ounce is an ounce of fine gold. *Mirabile dictu!*

But whereinell, or elsewhere, are we at now? Let us see. Still continuing, he states, "the Government has arbitrarily fixed the price of gold"; and, from the foregoing, it would seem reasonable that it has done so (even if indirectly) if the price of a fine gold ounce can, consistently, be said to be an ounce of fine gold!

Similarly, as the Government has adopted avoirdupois weight, it can be stated, just as reasonably, that it (the Government) has, "arbitrarily," fixed the price of a ton of coal at twenty hundredweight of coal; because, if the price of gold can be stated in terms of gold, then the price of coal can be stated in terms of coal, and the price of cotton can be expressed in terms of cotton, and so on throughout the entire list of commodities and other things that can be "priced" in the sense that the Government has priced gold.

But, unfortunately for Mr. Lawrie's line of reasoning, all "prices" are relative, in the sense of being comparative; and, therefore, in expressing "price," it is customary to give or state the exchange value of any thing in terms of *something else*, which means that at least *two different things* must be taken into consideration.

A prominent political economist says: "A price is a relation between two factors, one money and the other goods. A change either in money or in goods will affect the relation between them."

The principal civilized nations of the world have chosen gold as that particular "something else," or standard, in terms of which the worth, exchange value or purchasing power of all other commodities, as well as services, may be most readily and conveniently expressed or *"priced."*

The ex-Kaiser of Germany and his associates in crime, in an unsuccessful attempt to gratify their lust for power, brought the business of the world into a condition bordering on chaos, and it became necessary for most of the nations involved in the late war to issue what are, virtually, paper promises to pay gold, for use as money in place of gold. Consequently, in most of those foreign countries, prices are now stated in terms of such paper currencies, the exchange values of which are based, principally, upon the credit of their respective nations.

To the uninformed, much confusion of thought regarding "prices" has been caused by the fact that *paper* "money" is used in place of *gold* money, and such confusion has been aggravated by the fact that the same name is often used to mean two entirely different things.

For example, in Great Britain, gold is now "priced" in terms of *paper* shillings. Before the war, the unit of exchange value there was 133.+ grains of fine gold; which, at the time of its birth, was named a "sovereign," or "pound sterling." A real shilling is one-twentieth of a sovereign; that is, it is one-twentieth of 113.+ grains of fine gold; which is 5.65 grains. Normally, an ounce of fine gold is 84.95 shillings (480 grains $\div$ 5.65 grains = 84.95s.) but, today, in Great Britain, gold is quoted in terms of paper currency, or *credit* money. If the "price" of gold there is 119 shillings per ounce, paper shillings are meant; and by subtracting 85 (for convenience, in place of 84.95) from 119, there remain 34 *paper* shillings; which is the premium paid for gold in paper currency, or credit "money." In other words, it takes 34 more paper "shillings" than gold "shillings" to buy an ounce of fine gold. Or, as expressed in percentage, ($34 \times 100 \div 85 = 40$ per cent) at 119 paper shillings per ounce, gold, in Great Britain, is selling at a premium of 40 per cent in credit "money." To go back to the time of our Civil War for comparison, it would be the same as a quotation of 140, for gold, in "greenbacks," as our paper "dollars" were called in those days; or 28.938 paper "dollars" per ounce.

If the prices of commodities in any particular country are expressed in terms of the currency of that country, it follows, conversely, that the price of such currency

must necessarily be expressed in terms of commodities.

The United States is on a gold basis. Our unit of exchange value is 23.22 grains of fine gold. The "prices" of commodities here, therefore, are expressed in terms of gold, and, conversely, the "price" of gold must be expressed in terms of commodities. In fixing, arbitrarily, what is (confusingly, to some people) termed the Mint "price" of gold, all that our Government did (in 1837) was to decide upon 25.8 grains of standard gold (nine-tenths fine) as the unit of exchange value; and of course in that event a troy ounce of fine gold furnishes enough gold to enable the Mint to make twenty of such coins (or a double eagle, or two eagles, or four half-eagles, or eight quarter-eagles) and have 15.6 grains (15.6 grains ÷ 23.22 = $0.6718) left over.

The late Horace White wrote: "We sometimes read of an 'ideal dollar,' a phrase implying that there may be a dollar whose value is not embodied in any tangible substance, but is purely a mental conception. That is impossible."

Since Mr. Lawrie, in his circular, says, "Had the price of gold ascended" (risen?) "to the average wholesale price of all other commodities," is it not entirely consistent, in the light of the foregoing, to ask him what is his "mental conception" of a "dollar"? Because, how can "the average wholesale price of all other commodities" ascend (rise) if the unit of value by which they are measured (or priced) rises to the same extent? Surely, if the unit rises in relative value, commodities must fall in "price," and, conversely, if commodities rise in "price" the unit (in terms of which prices are stated) must fall. The measure of value and the thing that it measures cannot both rise or fall at the same time!

What do you suppose constitutes Mr. Lawrie's "ideal dollar"?

W. DE L. BENEDICT.

New York, N. Y.

Botany and Geology

I read with much interest F. M. Wichman's article on "Botany Applied to Mining," and the editorial on the subject, in your issue of Dec. 11, 1920.

A striking example of the effects of rock and corresponding soil differences may be seen on "Rocky Hill," a couple of miles east of Exeter, Tulare County, Cal. Rocky Hill is a rough granitic mass, intrusive into serpentine rock, gabbro, and other basic igneous rocks, the range being the western foothills of the Sierra Nevada Mountains. On Rocky Hill, Wislizenus oaks are growing, and it is of particular interest to note that these oaks grow only upon the granite, extending right up to the contacts of the basic rocks, which latter are here entirely treeless.

It is not a question of altitude, climate, or lay of the land, soil differences alone being apparently directly or indirectly responsible for the differences in vegetation. The decided preference of the oaks for this and for other granitic hills in the region may be due to several things, such as a lighter looser soil, different moisture conditions, lack of cracks in summer in the granite soil, no grass fires when the trees were young, and the presence of far more potash in the granite than in the basic rocks. Furthermore, reddish and green lichens and mossy growths are common on the outcrops of the basic igneous rocks here, but are rare on the granitic rocks. Some plants grow under conditions which would kill others, such as salt grass and certain salt bushes and samphires, which are able to put up with a good deal of salt and alkali. On the other hand, cranberries cannot grow in a soil that is the least bit alkaline.

In parts of California, prickly pear is abundant on the south sides of the hills, with quite a different vegetation, no cactus, and much better soil in many cases on the north slopes of the same hills. Again, white sage and lupines frequently take the place of the "greasewood" *(Adenostoma)* destroyed by bush fires. Desert regions have their own distinctive flora, adapted in various ways to withstand the hard conditions. The famous calamine violet *(Viola calamisaria)* of Westphalia, is an illustration of the effects of soil ingredients, for the flower, which is normally blue, is said to be yellow where the plant is growing on the decomposed outcrops of zinc ore deposits.

In eastern Riverside County, Cal., the creosote bush may be seen growing rather sparsely upon solid beds of gypsum, but it was noted that the other plants associated with the creosote bush in the vicinity largely avoided the gypsum beds. To one who has come under the spell of our southwestern deserts this creosote bush inspires much the same feeling as does the pine, beloved of the mountaineer. Certain pines, by the way, flourish where oaks would starve to death, and it is of extreme interest to note that the Torrey pine is known only in a small area on the coast of Southern California and on Santa Rosa Island, off the coast.

Altitude and the corresponding climate are also very important factors, and the natural vegetation of a region is separated into more or less sharply defined zones, characteristic of certain elevations above sea level. That weird plant, the tree yucca or "Joshua," *(Yucca arborescens)*, common in arid parts of the Southwest, grows up to an elevation of 6,000 ft., as at Goldfield, Nev., but I have never seen it as yet below an altitude of 2,000 ft. This yucca is pollenized by a certain moth, which acts as if it thoroughly understood the function of pollen.

Green algæ may be seen growing on rocks, alongside streams of nearly boiling water, at Arrowhead Springs, north of San Bernardino, Cal., and certain observations on algæ are mentioned by J. W. Shipley, in the *American Journal of Science* of August, 1920, in an article on the volcanic emanations and incrustations in the Valley of Ten Thousand Smokes, Katmai, Alaska. Mr. Shipley remarks: "Volatile ammonium compounds were detected in almost all of the vapors examined . . . a rather interesting relationship between the growth of blue-green algæ and the presence of ammonia compounds in the emanations was established. Algæ were found growing up to the edge of vents where the thermometer indicated one hundred degrees centigrade. No algæ grew where the vapors showed an absence of ammonium. This relationship held over the large areas where the gases were slowly exuding through the porous mud flow. Apparently, the evolution of ammonia compounds was quite general, for the afternoon sun disclosed the slopes surrounding Novarapta clothed in a coat of green provided by the growth of algæ."

Some striking illustrations of the effects upon vegetation of slight differences in environment are mentioned by E. J. Russell in his excellent book, "Soil Conditions and Plant Growth." For instance, in Romney Marsh there are pastures with rye grass, white clover, crested dog's tail and agrostis, easily capable of fattening sheep in summer without any other food. All round these

pastures are others with the same type of vegetation, but the plants grow more slowly, produce more stem and less leaf, are less nutritious and are incapable of fattening sheep. Again, the grass on Lower Lias pastures in Somersetshire and Warwickshire causes acute diarrhœa or "scouring" in cattle, whereas grass on adjoining alluvial pastures does not. Finally, potatoes grown in the Dunbar district are remarkable for their quality and will stand boiling and subsequent warming up without turning black. The same varieties of potatoes grown in the same way in the Fens blacken badly under the same treatment, and consequently command a much lower market price.

In many places belts of serpentine rock may be identified from afar by the scanty vegetation upon them. On the other hand, soils derived from limestone are in many instances very fertile, although limestones contain on an average only about one-third of 1 per cent of potash. In weathering, however, much of the lime is removed in solution, whereas the potash is concentrated in the residual material. We have therefore to consider, in dealing with soils and vegetation, not only the composition of the parent rocks but also how these rocks weather into soils. In short, "Botany Applied to Geology" is a subject of great scientific and practical interest, and by making and assembling observations we shall know more about it than we do now.

Porterville, Cal. GORDON SURR.

Does a Vein Which Cuts a Bed Meet Said Bed Anywhere?

In your editorial entitled "The Utah Consolidated-Utah Apex Lawsuit," appearing in the issue of Nov. 13, 1920, you frankly confess that your "knowledge of the question in dispute is limited and perhaps inadequate" to enable you to take sides in so delicate a matter "among friends." I am quite convinced that there is no "perhaps" about it. You display a surprising lack of knowledge of the facts involved and of the nature of the testimony given in the case. However, you suggest some things of a geological nature that are new and strange to me, and possibly so to others, particularly so to those who were engaged as witnesses in the suit.

Your editorial says, "The sole point at issue, according to our correspondent, was as to whether certain limestone formations, known as the Highland Boy and the Yampa, which were ore-bearing formations, were the lodes in the legal sense, or whether the almost *vertical veins which cut them* at nearly right angles were the lodes. Orebodies were shown by the evidence to have occurred frequently at the *junction of the vertical veins with the limestone*." I am certain that the witnesses for the Utah Consolidated did not find the geological conditions to be as you describe them. I do not believe that the Utah Apex witnesses found such a curious geological freak, or, if they did, they were careful to keep this newly discovered geological phenomenon to themselves. Possibly Dr. Lindgren did not want to let Dr. Kemp in on it just at that time. It remained for you to enlighten us, and I for one am glad to know that you have found in the Bingham district a case where a vertical vein cuts a limestone and at the same time forms a junction with it. I congratulate you, Mr. Editor.

You tell us further that the "limestone formations" outcrop in Utah Consolidated ground and the "vertical vein-fissures" outcrop in Utah Apex ground, and since orebodies "occurred frequently at the junction of the vertical veins with the limestone" the following question of law naturally presented itself: "To which party belonged the ore at the junction?" Meaning, I take it, the "*junction*" between the "limestone formations" and the intersecting "vertical veins."

A good "apex law twister" might warp the apex law with apparent ease, but I do not believe his most vigorous massage treatment would cure a geological deformity like that. Is it any wonder that it cost two mining companies over half a million dollars, trying to make the geology in the case clear to a jurist who may never have seen "geology applied to mining"? It takes "journalism" applied to geology to make that kind of a stunt in geological gymnastics appear easy, to say nothing of bringing to light "quartzites which lie between limestone."

And, speaking of broad lodes and country-rock advocates, I have in mind a recent apex suit where one witness included within his broad lode a body of unmineralized quartzite 200 to 500 ft. thick and many hundreds of feet in length, and, Mr. Editor, the "sky" *was* his limit for a hanging wall, just as you suggest for your great "Bingham Canyon Lode," and that witness wasn't a country-rock advocate either. Happily, of course, his view was upheld by the court, so that you will, no doubt, refrain from classing said witness with the "country-rockers."

In the Utah case, the country-rock advocates may find some consolation in your keen observation that they limited their "testimony very conscientiously to the facts." Who told you that, Mr. Editor? Have you been out in Bingham checking up? It is too bad that the powers of observations of the Utah Consolidated witnesses were limited to such an extent that they could not see the "junction" between the "veins and limestone," because the lode locations owned by their client were senior to those of the Utah Apex Co. And, Mr. Editor, do you know that there isn't one word in the decision of the court about junctions between veins and limestones—not even a suggestion of such a thing? The Utah Consolidated witnesses couldn't find them, the Apex witnesses couldn't find them, the court couldn't find them. I guess "everyone was out o' step but the Editor."

It is evident from the decision in the case that the country-rock advocates did not prove to the court that black was white. The "legal brotherhood" couldn't do it either. Both having failed after forty years of trying, it now remains for the geolo-journalist to take up the task. After having discovered the existence of a junction between a fissure-vein and a limestone bed intersected by said fissure-vein, the black and white problem should be easy. RENO H. SALES.

Butte, Mont.

An Apology

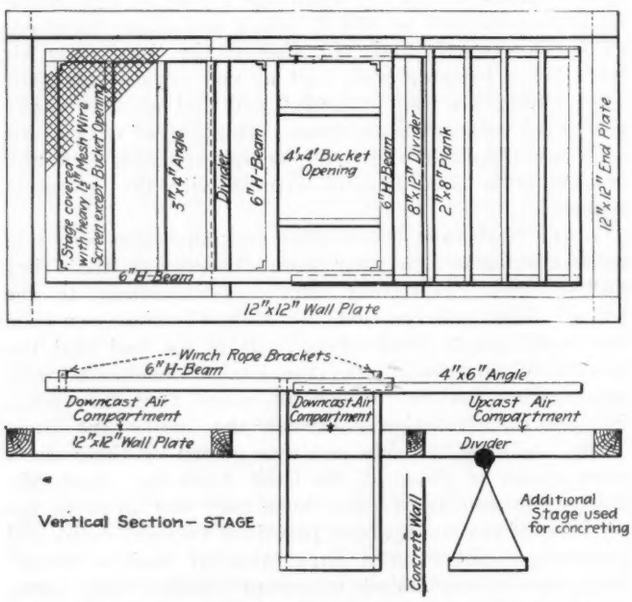
A contributor writes us in submitting his latest: "As you know, I have been very much occupied for the last six months or more in getting married and settling down after that. I am glad to say that all that is over now." Settled and glad it is all over! But it isn't. Like copper, a man must experience several blows after settling before it can truly be said that he is really converted. But that does not mean that he is 99 per cent. Some blister is badly gassed and runs as low as 98.3.

Alteration in a Ventilation Shaft

Placing a Reinforced-Concrete Divider in an Alabama Shaft, Used for Ventilation Purposes, Without Interruption to the Fan Service—Good Progress Was Made and Costs Were in Keeping With Current Prices

BY J. H. STOVEL*
Written for *Engineering and Mining Journal*

EARLY in 1920 it was necessary to increase the ventilation at the Mulga coal mine, of the Woodward Iron Co. at Mulga, Ala. The company's No. 2 shaft, 12 ft. x 24 ft., three-compartment, originally a hoisting shaft, was used for ventilation only, two compartments being downcast and one compartment upcast. The shaft timbers were badly rotted, and the loss of air between the upcast and downcast was heavy. It was decided to remove the shaft timbers entirely and to build a reinforced-concrete wall from the level to be ventilated



PLAN AND SECTION OF SHAFT TIMBERS AND STAGE

to the surface, a distance of 225 ft. This work was done, under contract, by the E. J. Longyear Co. of Minneapolis, Minn.

The downcast airway was changed temporarily to the manway slope entry of the mine. The upcast feature of the shaft had to be maintained, as no interruption of the fan was possible without shutting down the mine. An air lock, of wooden construction, was built over the two previous downcast compartments, trap doors being provided in the floor for passage of the bucket and a door in the side of the building for the removal of material.

STAGES USED IN REMOVING SHAFT TIMBERS

Owing to the dangerous condition of shaft timbers, these had to be removed from the top downward, and the stage for doing this work had also to be suitable for the later work of building the concrete wall. The form adopted is shown in Fig. 1 and proved excellent for both purposes. The main portion of the stage—that part over the two downcast compartments—was hung in the shaft before the air lock was completed. It was supported by steel cables, operated by hand winches. When the air lock was completed, the partition between the upcast and downcast compartment was torn out opposite the stage, thus converting the entire shaft into an upcast airway and permitting bolting to the main stage that part which projected into the original upcast compartment. A secondary stage was hung from the main stage, about 6½ ft. below it, in the middle compartment of the shaft, and an opening was left in the main stage directly above it, so that the bucket could always be lowered to it. The wire-mesh screen used for the flooring of the stage was adopted in order to allow a free passage of air, but it also provided a safe footing for the men.

In tearing out the timbers, the stage was lowered until the lower stage was about three feet below the dividers of the set to be pulled, and the men working on the lower stage chopped or sawed the dividers out. The guides and sealing between compartments were then torn out, loaded into the bucket, and hoisted to surface. The stage was then lowered until the upper part was about three feet below the set being pulled. The wall plates were chopped in two, and then it was only a question of loading timbers into the bucket and hoisting. To aid in loading, the bucket was kept about a foot below the level of the top of the stage, so that timbers could be slid into it with a minimum of effort. The crew for this work consisted of a foreman, four shaft miners, one lander, one hoistman, one teamster, and a carpenter, who was kept busy sharpening tools and building forms for the concrete work. Normally this crew could pull two sets in an eight-hour shift, but where much scaling was necessary, as was frequently the condition, this rate was not maintained. Only one serious obstacle was encountered on the way down, this being a heavy double-deck cage which had been left hanging in the shaft. It was cut into sections with an oxy-acetylene torch.

PANEL FORMS OBVIATE USE OF SPRAGGING

As soon as the level was reached and the debris cleaned out the concrete dividing wall was started. This wall was eight inches thick, with ¾-in. round iron bars, placed horizontally and vertically at about two-foot centers, for reinforcing, and it was carried up in the line of the dividers which had separated the upcast and downcast compartments. The forms for the first ten feet of wall were built in place, a 3-ft. x 5 ft. opening being left in the bottom. The remainder of the wall was carried up by means of wooden panel forms 14 ft. long and 5 ft. high. To place these panels on both sides of the wall, the floor of the stage over the upcast compartment was ripped out and a small stage was hung from the framework at the same level as the lower stage in the middle compartment. The panels were lowered by slings, attached a little off center, beyond the frame-

*Mining Superintendent, E. J. Longyear Co.

AIR LOCK AND MIXER AT MULGA SHAFT

work of the stage, and then raised into a horizontal position and set in place. The bottom of the panel which was being placed was fastened to the top of the one already in position by means of spikes partially driven in. Spaces between panel ends and the sides of the shaft were boarded up and caulked. The panels were wired together, a spacer of ¾-in. round iron eight inches long being used with each tie. These ties and spacers made it necessary to plumb only one side of the wall. As soon as a panel was finished the concrete was poured into it, for it was found by handling it in this manner that almost no spragging was needed to keep the wall in place.

A gasoline-driven mixer was set up close to the shaft, and the necessary sand, gravel, and cement were hauled while the crew was busy setting forms. The mixer discharged into a pipe, inserted through the air lock into the shaft, which was open only when the mixer was discharging, and emptied into a bucket that was used to lower the concrete to the forms. The crew for concreting and setting forms consisted of a foreman, four shaftmen, one lander, one hoistman, one carpenter, and a teamster and helper. Once in the swing of the work, this crew could erect and pour from two to three sets per shift, and on one occasion completed four sets (twenty feet) in that time. The actual concreting rarely took over thirty-five minutes.

Only fourteen sets of panels were made, necessitating stripping and re-using. This work was interesting only because of the manner in which the stage was used to accomplish it. The stage would be lowered until the framework projecting into the upcast compartment rested on the concrete wall. One set of winch cables, supporting the stage, was taken off and attached to the small stage in the upcast compartment. This stage was then detached from the main stage and lowered so that men working on it could strip the forms and lower them to the bottom of the compartment. The small stage was again fastened to the main stage, and the operation repeated, on the other side of the wall, with the lower stage in the middle compartment. On this side, however, the forms were hoisted direct to surface, and then the men went to the bottom and brought the forms from the other side of the wall through the 3-ft. x 5-ft. opening, which had been left in the wall, and these were then hoisted to the surface. The crew would strip off thirteen sets (sixty-five feet) of panels in three shifts.

The crew was employed on this work for 130 shifts, including the time of building, and later tearing down, the air lock. The whole operation was carried through without any interruptions to the fan service.

The costs per cubic yard of the concreting work were as follows: Forms, $7.13; placing forms, $11.88; pouring concrete, including reinforcing used, $18.06; removal of forms, $5.90; or a total cost of $42.97 per cubic yard. These costs are, of course, not comparable to ordinary concreting costs, but should be of interest to anyone considering similar work. It is well to remember also, in connection with these costs, that the work was carried out at the high peak of prices, both in labor and materials.

Cost of Carbide at Mines

Written for *Engineering and Mining Journal*

Quantities and costs of calcium carbide used in miners' lamps are presented in the table. The figures are from a Minnesota iron mine and were taken during a part of 1916. At the time the mine was operated on three eight-hour shifts. Carbide then sold for approximately 3c. per lb., or $60 per ton. It is now $106 per ton in the region east of the Mississippi and north of Chattanooga, and $126 per ton in the Western States.

CONSUMPTION OF CARBIDE IN UNDERGROUND MINING

1916:	Carbide, Lb.	Working Days per Month	Average No. of Men	Carbide per Man-Shift, Lb.	—Cost per Shift per Man— $60 per Ton	$106 per Ton
January	4,130	25	416	0.40	$0.012	$0.021
February	4,664	25	405	0.46	.014	.025
March	4,188	27	391	0.40	.012	.021
April	3,806	24	394	0.40	.012	.021
May	5,150	27	427	0.45	.013	.023
June	2,635	26	282	0.36	.011	.019
July	2,048	25	202	0.41	.012	.021
August	2,767	27	271	0.38	.011	.019
September	3,400	26	293	0.45	.013	.023
October	4,000	26	370	0.42	.012	.021

In the illustration graphic representation of carbide costs on the basis of 1,000 and 100 shifts is given for rates of consumption ranging from 0.35 lb. up to 0.5 lb. per man-shift. In the table the last column has been figured on the basis of carbide at $106 per ton for purposes of comparison.

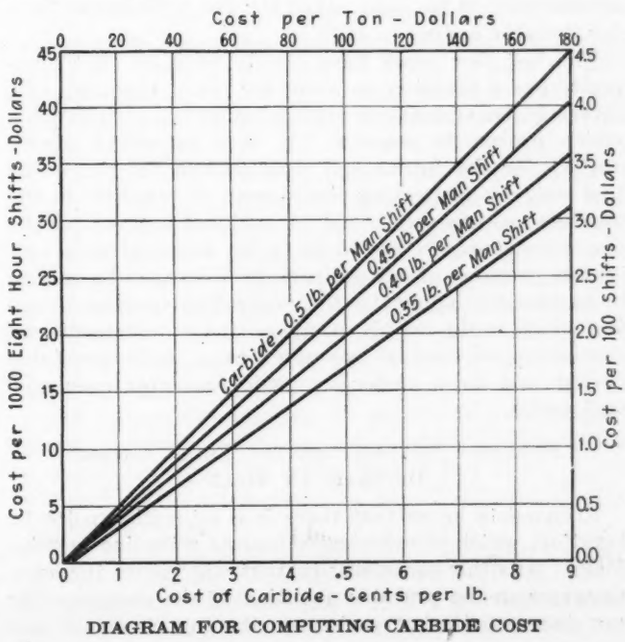

Cost per Ton - Dollars
0 20 40 60 80 100 120 140 160 180
Cost per 1000 Eight Hour Shifts - Dollars
0 5 10 15 20 25 30 35 40 45
Cost per 100 Shifts - Dollars
0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5
Carbide - 0.5 lb. per Man Shift
0.45 lb. per Man Shift
0.40 lb. per Man Shift
0.35 lb. per Man Shift
0 1 2 3 4 .5 6 7 8 9
Cost of Carbide - Cents per lb.

DIAGRAM FOR COMPUTING CARBIDE COST

Federal Tax Reform and the Mining Industry

Government Must Solve Problems Without Material Reduction in Revenue—Unanimous Opposition Testifies to Excess-Profits Tax Defects—Other Ways of Taxing Corporation Profits Proposed—General Sales Tax Defective

BY ROBERT G. WILSON
Written for *Engineering and Mining Journal*

UNCOMFORTABLE and ofttimes distressing experience with war-time taxes has forced recognition of the fact that Federal taxation is a science still inexact in practice if not in theory, and that the swollen revenue requirements of the Government, with the resulting need for more equality in the assessment, have made this science a highly complex and technical branch of political economy.

The present situation is a flux, a process of experimentation and struggle for the elusive ideal of tax distribution. Revision of the statutes is inevitable, not merely to eliminate the laws of expediency justifiable only under the emergencies of actual war, but also to refine and improve the operation of the more acceptable devices. There is the further consideration of the concern of the Government, in the period of deflation, for its revenues, now dependent upon inflated profits that to a large extent no longer exist. We may well interest ourselves merely in the nature and effect of revision. Legislative action is made certain by the pressing necessities of the Government itself.

However urgent the need for reform, the forthcoming changes cannot be viewed by industry without some apprehension. We are told by officials in high places that there can be no material reduction of the tax volume for several years; that the repeal of the excess-profits tax and modification of the operation of the income tax are contingent upon finding other sources for compensatory revenue, or upon increasing the rates of taxes remaining upon the statutes. It is probable that the income-tax rates will be advanced. The total appropriations of the last Congress were $4,859,890,327.30 for the fiscal year ending June 30 next. The present session has been asked for but $200,000,000 less for the year ending in 1922.

The last few years have clearly revealed that prosperity has a tendency to make for heavy taxation, and, inversely, heavy taxation retards industrial activity upon which prosperity depends. It is a somewhat dismal augury for the future and must lead to the conclusion that only by restricting the volume of taxation to the absolute minimum required for national welfare can the Government expect the co-operation essential to a successful program of rehabilitation. This may be said to be particularly applicable to co-operation from an industry which could readily postpone the development and conversion of natural resources to a more profitable period, and do so under economic pressures even now sufficient.

TAXATION BEYOND CERTAIN POINT CAUSES DECREASE IN YIELD

Economists agree that there is a saturation point in taxation, which if overstepped causes a decline in total yield. It is this consideration that will partly influence Congress in the probable abolition of the excess-profits tax and reduction of surtaxes. Its import should also be acknowledged in any movement toward increase of the income tax, one effect of which must inevitably be, with the elimination of the excess-profits tax, the shifting of part of the obligations of the highly profitable enterprise to the less profitable.

The mining industry has unqualifiedly supported the movement to abolish the excess-profits tax. "Excess profits," even profits in excess of the narrow and non-discriminating standard of the existing law, are now rarely resulting from mining operations, particularly metal mining. The war brought temporarily increased income, which has subsided, but it also brought increased costs, which remain. We find on the one hand invested capital augmented by reinvested profits, and on the other decreased current income, with the result that the majority of even the most substantial mining companies now find their net taxable receipts equivalent to less than 8 per cent of the total capital. So far as the business of mining is concerned, the return to normalcy has already resulted in most instances in a situation distinctly subnormal. Metal prices have dropped with a suddenness that has accentuated rather than relieved the economic stress of the nation.

MINING INDUSTRY'S OPPOSITION TO EXCESS-PROFITS TAX CREDITABLE

As the *Engineering and Mining Journal* recently said of another matter, we are primarily interested in our own industry, believing that public-spiritedness begins at home. Repeal of the excess-profits tax probably means an increase in the rate of income taxes which even the concern with the narrowest margin of profit is obliged to pay, and the obvious corollary is that a larger tax payment by most companies must be the immediate consequence. Yet the excess-profits tax is abnormal and has no place in practical affairs. Perhaps no Federal statute has ever been more generally decried by the business community. The virtually unanimous opposition is proof of its defects. Nevertheless, it must enure to the credit of the mining industry that even those operators who can obtain no relief from its suppression, but, on the contrary, will find their obligations increased, have unhesitatingly joined in the demand for repeal. It is one answer to those who have protested that the industry is pulling too hard for its special interests, and those who, upon false and ignorant premises, have cried "discrimination" because the revenue laws finally contain special provisions applicable to mining, provisions which merely permit the taxation of income rather than capital under income-tax laws.

No real adjustment of the Federal system of taxation can be accomplished at the present short session of Congress, although hearings have been started before the House committee. The program is concerned more with appropriations for the spending of money than with legislation for raising it. The popular demand is for no mere temporary compromise of the existing difficulties,

but for a stabilized system which will readily lend itself to simple adjustment by changes in rates from time to time, without necessity for constant changes in basic methods. It is doubtful whether there would be sufficient time for true tax reform before March 4, even were all other business set aside. Perhaps as a compromise the present Congress will enact H. R. 14,198, a bill which passed the House at the last session and which is designed to facilitate the administration of the Revenue Act of 1918, and some means may be adopted to effect an early clearance of accumulated war tax settlements.

Modification of the revenue laws is not the only or the most urgent taxation problem. The most imperative need of the moment is a definite determination of the liability of each taxpayer for prior years.

The American Mining Congress, mindful of the general uncertainty of business as well as with particular thought for the inherently complex problems of the mining industry, has recommended legislation authorizing the appointment of a temporary board of ten special commissioners of revenue, vested with sufficient authority to clear up the situation. Such a board would only pass upon the unsettled cases consequent upon the war-time period of 1917 to 1919, inclusive, and would have the power not now reposed in the Revenue Bureau to compromise in simple equity. It is a fact that in many instances a proper assessment of tax is impossible under literal application of the law. The administrative effort required of the authorities has in these cases merely resulted in alternate concessions and denials, or arbitrary interpretations frequently contested by the taxpayer. The natural outcome will be endless litigation unless steps be taken to dispose of the disputes otherwise.

This special board should have the additional power to postpone payment of taxes for reasonable periods or to provide for payment in instalments where deemed necessary to prevent undue hardship on the taxpayer. Final settlement of cases would be aided by provision for an agreement between the board and the taxpayer, which, under the necessary statute, would forever prohibit litigation, except upon a showing of fraud or misrepresentation of fact. The plan simply provides an effective means of relieving the existing situation, much in the same manner as the claims of citizens against the War and Navy departments were cleared under suddenly terminated war contracts. It becomes a part of the general effort to clean up and forget the "hang-overs" of war. Considerable advantage to the Government itself would result from additional revenue realized in a time of urgent need. The cost would amount to but a fraction of the saving in interest alone.

Proposed Board Should Include Those Familiar with Mining Industry

It is highly desirable that at least three members of the proposed Federal board, without necessarily directly representing the mining industry, should be thoroughly conversant with the practices and problems of mineral extraction and metal manufacturing. Perhaps a guide to the respective professional qualifications and industrial representation may be found in the proportionate payment of taxes. As nearly as ascertainable, the mineral and smelting industries contribute at least 18 per cent and metal manufacturing approximately the same percentage, or a total in excess of one-third of the total Federal taxes. This, however, is not the only criterion. The mining industry has many problems peculiarly its own, but it also contends with virtually all of those met in other industries. Accountants, lawyers, and specialists familiar with the taxation of the agricultural or agricultural products industry, for instance, would probably not feel qualified to pass upon complicated mining cases, but specialists chiefly versed in mining could readily be called into consultation in matters affecting other lines. The scope of the board must be broad.

There is in this proposal no reflection upon the personnel of the Revenue Bureau, which is laboring under the difficulties of red tape, insufficient forces, and lack of authority. It has simply faced a task that requires more than ordinary means and methods of tax administration.

Other Forms of Corporation-Profits Tax Proposed

Looking to the future of taxation, it is likely that the laws will be revised at a special session called under the new administration. Without assuming prophecy, one may refer to the most probable substitute or substitutes for the excess-profits tax and means of modifying the income tax. The Secretary of the Treasury recommended to Congress that the excess-profits tax be replaced by another form of corporation-profits tax, preferably a tax on undistributed profits, or, failing that, a "corporation surtax" at a flat rate as a partial replacement. The latter would become virtually the equivalent of an increase in the income-tax rates. In addition, the Secretary suggested increasing excise and luxury taxes, and new sales taxes upon commodities of wide distribution, but *not* a general sales or turnover tax. Readjustment of the excessive surtaxes has been recommended for the reason that they have driven wealth into tax-free securities, thereby eliminating sources of revenue most easily tapped.

The recommendations of the Secretary of the Treasury closely approximate the proposals of the Allied Tax Committee in the report submitted to the National Industrial Tax Conference in New York City in October. That committee, however, distinctly determined upon a simple increase of the corporation-income tax as a partial replacement of the excess-profits tax, rather than a tax upon undistributed profits. The latter in many instances would have a highly inequitable application. It could not fail to act as a penalty upon reinvestment in necessary industrial expansion, even now restricted by other tax measures and economic influences in general.

The position is taken by many that with economy in Governmental expenditures, increased tariff, and other changes Congress could dispense with the excess-profits tax and require no substitute. Tax students, however, are endeavoring to preserve some sort of balance between the incorporated and unincorporated forms of business. Relatively high surtaxes upon personal incomes will remain in the law, however they may be adjusted, and the removal of all corporation surtaxes would necessarily penalize the individual and the partnership. There is also the ever-present sentiment that a premium should be paid, beyond the more or less nominal capital-stock tax, for the privileges conferred upon corporations.

The much-discussed sales or turnover tax still has defenders, despite its desertion by many of the original advocates. In fact, the question of a general sales tax

or a combined increase in income and limited excise taxes may become the principal taxation issue in Congress. The complications of the present system have caused a demand for simplicity, and relative simplicity is the chief virtue of a sales tax, if there be virtue in it. However, simplicity is not a concomitant of equity in taxation, particularly billion-dollar taxation. No simple device of general application can permit of even approximately equitable levies upon so complex an industry as mining, for instance. Many forms of sales taxes have been proposed, but the most organized propaganda is that which supports a flat duty of 1, 1½ or 2 per cent upon all turnovers of commodities, services, and property in general. It is intended as the only tax on "business," although graduated taxes upon personal incomes would remain. A sales tax to this extent has little chance. Congress is unlikely to rescind all corporation taxes, including those founded upon approved principles, to undertake a dubious experiment.

General Sales Tax Defective

The chief defect of the general sales tax, and it is a glaring one, is that it ignores the capacity of the taxpayer to meet the obligation imposed. If it could not be shifted to the consumer, as frequently would be the case, it would rest upon one of the poorest determinants of tax liability, gross income. If it were shifted it would bear upon the necessities of the masses at the same rate as upon the luxuries of wealth. The political aspects are obvious. The proponents of the sales tax hold that it will be shifted, and that the existing excess-profits tax is passed on to the consumer. The extent of the latter practice is in dispute and will never be proved, but if it be so, it is a poor substitute that accomplishes the same result.

A well-administered income tax, as a single measure, is the nearest approach to a true equalizer of the tax burden, particularly a burden as heavy as that now imposed. It is true that the country has rushed to the extremes of direct income taxation and that a wider distribution would have many advantages, but that can be better regulated through excises upon luxuries and a few commodities of general use. Appreciable as the revenue would be in the aggregate, the small individual contribution would inflict no real hardship.

Nowhere would a general sales tax have more uncertain, capricious and inequitable effect than upon mining and all of the so-called wasting industries. It would distribute the burden widely but not wisely. The tax would apply in the periods of exploration and unprofitable operation, when "ability to pay" had not developed, at the same rate as upon successful ventures. The low rate of the proposed sales tax is deceiving. The pyramided effect of the shifting to the operator of even 1 or 2 per cent upon each turnover in the process of manufacture and transportation of all equipment and supplies essential to mining, and the additional tax upon gross sales that rarely could be shifted in turn, would be considerable in the aggregate.

Revenue Bureau records show that mining and the allied industries have been paying their full quota of Federal taxes. It is not likely that the sales tax would bring a reduction of the total obligation. "Ability to pay" has been found an acceptable principle, obnoxious only when excessive in application. Ergo, so radical a replacement as that by a sales tax can mean but an indiscriminate scattering, regardless of consequences.

Ontario's Nickel Production Curtailed

During the first nine months of 1920, a total of 925,378 tons of nickel ore was raised at the Creighton, Murray, Garson, Levack, Bruce, Victoria No. 1, and Worthington mines, according to the Ontario Department of Mines. Ore smelted at Copper Cliff, Coniston, and Nickelton totaled 809,022 tons, from which 44,922 tons of bessemer matte was produced. To the United States and Wales 31,800 tons of matte was exported, and 12,531 tons was treated in Canadian refineries at Port Colborne, Ontario, and Deschenes, Que.

At the beginning of the year smelting of nickel-copper ores was back again to a pre-war basis after the greatly curtailed production in the early part of 1919, which followed an abnormally large output in 1918. Although production increased from 30,942 tons of bessemer matte for the first nine months of 1919 to 44,922 tons for the corresponding period in 1920, conditions since Sept. 30 have considerably reduced this rate of production. The present market for both nickel and copper is dull, and stocks have accumulated. In consequence, the International Nickel Co. of Canada was obliged to curtail operations both at Copper Cliff and Port Colborne on Nov. 1 to the extent of 25 per cent.

In the bulletin for the half year ending June 30 it was stated that nickel-copper matte was in process of treatment at the new refinery of the British America Nickel Corporation at Deschenes. Electrolytic nickel and copper were produced during the latter part of the nine months' period. The International company markets a considerable part of the nickel.

During the period 135,023 short tons of ore was mined by the Algoma Steel Corporation and Moose Mountain, Ltd.

The furnaces of the Standard Iron Co. at Deseronto, the Midland Iron & Steel Co., and the Parry Sound Iron Co. have not been in blast since June, August, and October, respectively, in 1919. Four stacks were operated by the Algoma Steel Corporation at Sault Ste. Marie, two by the Steel Company of Canada at Hamilton, and one by the Canadian Furnace Co. at Port Colborne. Of a total of 1,036,229 tons of ore smelted, only 99,916 tons, or 9.64 per cent, was of Ontario origin. In steel making, 252,797 tons of pig-iron product was used. The total steel output at Sault Ste. Marie and Hamilton was 525,084 tons, worth $19,253,470.

Smelter Production of Zinc

The production of primary metallic zinc from domestic ores in 1920, according to the U. S. Geological Survey, was about 449,000 tons and from foreign ores about 14,000 tons, a total of 463,000 tons, compared with 452,272, 13,471, and 465,743 tons, respectively, in 1919. Of the output of domestic zinc in 1920 about 51,000 tons consisted of electrolytic zinc, as compared with 27,056 tons in 1919. In addition to primary zinc there was an output of about 20,000 tons of redistilled secondary zinc, compared with 19,748 tons in 1919, making a total supply of distilled zinc and electrolytic zinc in 1920 of 483,000 tons, of which 81,000 tons was high-grade zinc, 34,000 tons intermediate, 51,000 tons select and brass special, and 317,000 tons Prime Western. The production of the corresponding grades in 1919 was 45,377, 39,173, 140,917, and 260,024 tons, respectively, a total of 485,491 tons.

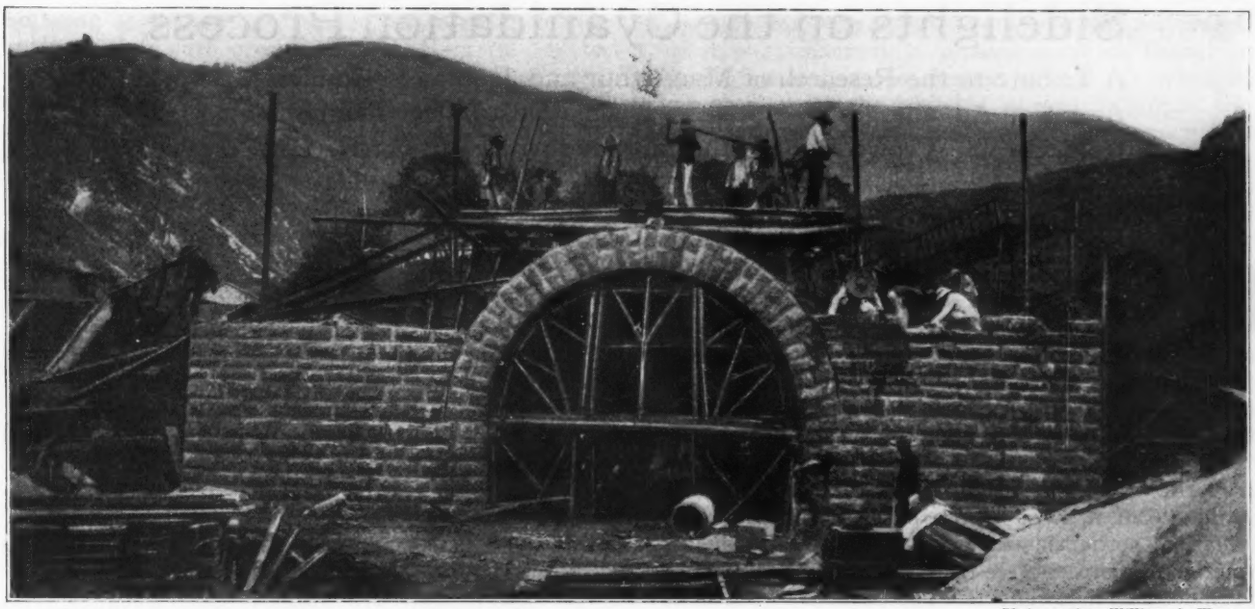


Photo courtesy William A. Wong.

TAYEH MINES, TAYEH, CHINA, NEW LOADING STATION OF REINFORCED CONCRETE, FACED WITH LIMESTONE MASONRY. FIFTY-TON GONDOLA CARS WILL ENTER THE TUNNEL AND BE LOADED BY GRAVITY WITHIN FIVE MINUTES. TWELVE CARS CAN ENTER THE TUNNEL FOR LOADING. ON THE OTHER END OF THIS TUNNEL WILL BE A MODERN ORE-CRUSHING PLANT, WITH A CAPACITY OF 3,500 TONS A DAY

Iron Mining in China

TAYEH IRON MINES, TAYEH, CHINA, LOADING STATION MINE CARS ARE LET DOWN THE INCLINED PLANES, ENTER INTO THE TIPPLES, DUMP INTO 11-TON RAILROAD WAGONS, AND HAUL FIFTEEN MILES OVER STANDARD-GAGE TRACKS TO THE MINES RIVER TERMINAL FOR EXPORT. THE CENTER OF THE PICTURE SHOWS THREE INCLINED PLANES LEADING TO THREE STEEL TRESTLES FOR THE STORAGE PILE

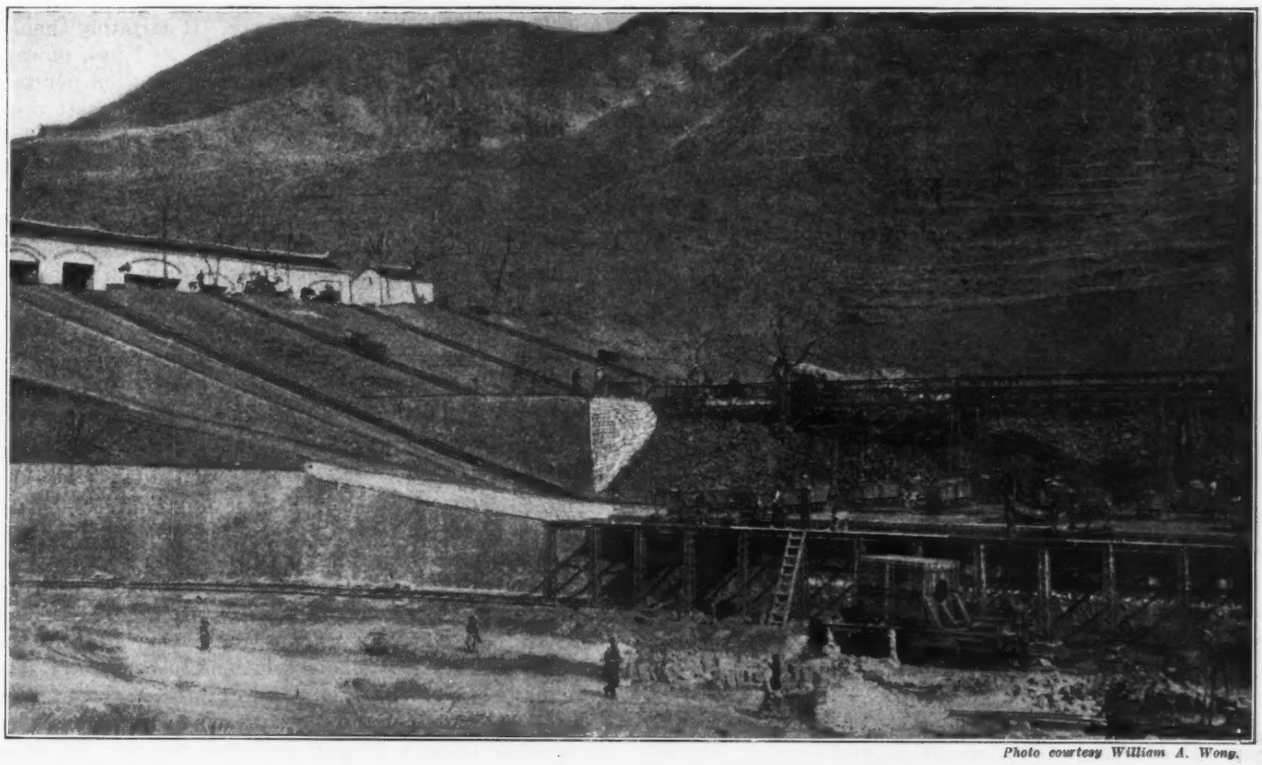


Photo courtesy William A. Wong.

Sidelights on the Cyanidation Process

A Tribute to the Research of MacArthur and Jennings—Counter-Current Agitation Advantages Questioned—Is Zinc Dust Better Than Shavings for Gold Ores?—Crowe Process the Outstanding Feature of Recent Practice

BY ALFRED JAMES*
Consulting Mining Engineer, London, England

IT IS PROPER to note, at the outset, the loss the industry has sustained by the death of John S. MacArthur and Hennen Jennings. It is a coincidence that these two giants of our industry, brought together by my work in South Africa, should have died within a few days of each other. To John S. MacArthur the world owes the invention and introduction of the process for the recovery of gold from refractory ores by means of dilute solutions of potassium cyanide. But it owes to him more than that; to his resolution, optimism, tenacity and industry is due the evolution of a process free from the unexpected reactions which doom so many efforts. The methods of regenerating foul working solutions into original efficacy, including the gain to be derived from the use of sodium sulphide, were carefully examined by him, and the information obtained was freely thrown open to the industry.

And yet to me it is doubtful whether the large-hearted encouragement and enterprise of Hennen Jennings were not of almost as great benefit to the industry as the initial work of MacArthur. Up to 1890 the process had not been hailed with enthusiasm, or even adopted by any outside party, except in one or perhaps two instances, for the treatment of small lots of rich concentrate. Following on my widening the sphere of the process, from the limited field of the treatment by costly agitation in small vessels, of rich refractory ores and concentrates, into the cheap gravitation percolation of (not so very) low-grade tailings, Hennen Jennings offered an opportunity of treating the rich Robinson tailings on such advantageous terms as enthused me to design and erect, and the Gold Recovery Syndicate to provide the funds for, the largest and first tailing plant in the world. Hennen Jennings was big enough to realize that the profits to be derived would mean enormous advantage to the South African industry, then faced with disaster from the bottoming of the oxidized ores. He obtained the required results, and to him is due the unqualified success of the South African gold fields, more than to any other man, with the possible exception of Hermann Eckstein, who was also a great man.

The main value of a patent is apt to be the fostering care of the inventor and his associates, who nurse the infant through all its weaknesses, accidents and obstructions into adolescence and vigorous manhood. Of what use is it to belittle Crowe's discovery—to which I refer later? Belittle it and it dies; encourage Crowe and the industry gains immensely. It is most unfortunate for South Africa that with the departure of Hennen Jennings the big mind ceased to be visible in local control. An examination of the Proceedings of local societies and of the local journals gives food for serious thought.

Before leaving the Rand in 1891 I had shown, at the Robinson and Salisbury plants, that the effluent from the zinc boxes should not carry more than one or two grains per ton, and in New Zealand we had confirmed this. Why then should the Rand have retrograded in four years to the position disclosed on pp. 187, 291 and 297 of Vol. I, *Jour. Chem. and Met. Soc.*?

From time to time I have asked for experimental investigation into matters of universal interest such as:

(1) The economical limits of coarseness of feed to tube mills, and of irregularity and size of mine rock substituted for pebbles, with a note of the gain or loss resulting from this practice (1911).

(2) The benefits and disadvantages resulting from heating solutions: Caldecott showed an increase in tonnage amounting to 20 per cent for only 25 hp. (1912).

(3) The recovery of cyanide from solutions of great strength, such as those used at Pachuca.

I was rewarded by figures from various quarters on the second topic (see pp. 86-91 "Cyanide Practice, 1910 to 1913") and on crushing costs, but it seems difficult to obtain the other figures requested.

COUNTER-CURRENT AGITATION, SOLUTION AND CLASSIFICATION

This scheme looks attractive; the heavy increase in the price of filter cloth is all in its favor; but its advantages remain to be proved over Rand decantation in costs, recoveries, or lessened quantity of solution to be precipitated: Eames (*Trans. A. I. M. E.*, Vol. LVII) states 3 parts of solution to 1 of ore. It certainly should require a cheaper plant, less attention, and less power. But the handling of large quantities of solution per ton treated is an objection. It is not merely a question of a cost, with zinc dust at 1/- per pound, or, say, 2½d. per ton of additional solution precipitated; also must be considered the extra cost and loss, in realizing the larger quantity of lower value zinc precipitate resulting from the utilization of double or three times the amount of zinc dust to precipitate, say, 3 dwt. (0.15 oz.) of gold from two or three tons of solution instead of from one ton. In this connection I reproduce a sentence from this review for 1909: "What the industry is set on obtaining is a high extraction with the handling of only one or at most two tons of solution per ton of dry slime treated."

PRECIPITATION OF GOLD

The Crowe process is the one outstanding novelty advanced during the war. It goes back to early practice, the exhaustion by vacuum of all solutions after lixiviation and prior to precipitation, as adopted in every plant known to me which was laid down by the patentees and their trained chemists during the whole life of the patents. In all early plants solutions to be precipitated were led to the precipitation boxes protected from access of air: the effluent, on the contrary, was always arranged to cascade from a height into the sumps. In these

*This is a part of Mr. James' annual article, entitled "Comments on Cyanidation and on Progress in Gold (and Silver) Ore Treatment, 1920." Most of the balance will be published in the *Engineering and Mining Journal* for Jan. 22, 1921.

notes for 1911 I referred to the zinc-dust precipitation then being so energetically pushed, as resulting in the formation of impure precipitate. N. Herz (p. 140 to 143, Vol. LII, *Trans. A. I. M. E.*) shows impurity of from 8.5 to 21 per cent introduced with zinc dust as against 1.32 per cent total impurities in commercial zinc shaving (Laminoirs à Zinc d'Engis), and the special zinc I originally advocated in "Cyanide Practice" was superior to this. My criticisms were not openly accepted, but obviously they were based on fact and were taken to heart; otherwise why the production of oxide-free "Merrillite" to replace ordinary zinc dust?

The Crowe advertisement places on record the heavy consumption of zinc by the zinc-dust process, even where complete precipitation is not attempted—in spite of the obvious evils of circulating only partly precipitated solutions. In "Cyanide Practice" I gave a consumption for South Africa of 2.5 oz. of zinc per ton of gold ore. But the South African consumption has perforce been high owing to the local practice of destroying by acid a large amount of zinc at each clean-up. In India the consumption varies from 1½ to 1⅝ oz. per ton treated. It is obvious from Crowe's results that the consumption of 0.407 lb. per ton of ore should never have been permitted. Ought not Crowe's figure of 0.191 lb. to be reduced to at least 0.17 lb. (African practice) or more accurately 0.07 lb. (Indian practice) by reversion to zinc shaving?

Operators should not be blinded by publication of consumptions per ton of solution instead of per ton of ore, which is the ultimate basis for records of costs. Otherwise a mill using five of solution to one of ore may thus be made, at 0.04 lb., to show a lower zinc consumption than when using two and one-half of solution to one of ore and showing 0.06 lb. per ton of solution.

The position is summed up by W. A. Caldecott (*Trans. A. I. M. E.*, Vol. LII, p. 69), who stated that "actual recovery of the gold, and not merely extraction from the ore, is the true objective. . . . Long experience has emphasized the desirability of maintaining the mill service water as free from gold as possible . . . if mysterious shortages of gold are to be avoided."

Bosqui had already stated (*idem*, p. 57) apropos his attempt to displace zinc (shaving) boxes at the New Modderfontein by the Merrill zinc-dust process: "The resultant gold-bearing weak or slime solution is comparatively simple in composition, with a very low metallic and cyanide content which rendered it extremely difficult to precipitate satisfactorily on zinc dust without additions of cyanide and lead acetate. Various measures were tried . . . but without success; and at this plant it was finally decided to revert to the older zinc-shaving method."

Again (p. 57): " inc dust . . . requires more care in manipulation than the zinc-shaving method, is liable to erratic fluctuations in efficiency without assignable cause, and requires the use of stronger solutions than are actually needed for dissolving purposes."

On the other hand, Herz (*idem*, p. 139) claims that "zinc dust has, with silver solutions, an efficiency double or treble that with gold solutions"; and his paper on zinc-dust precipitation contains food for reflection and matter for continued reference. It offers justification for the adoption of zinc dust for the precipitation of silver from its solution; a justification I have yet to find in the case of gold, where a thoroughly efficient process has stood the test of years, and has proved superior to every method brought against it. Because the inventor of the zinc box, who happens to be me, did not patent it, or stick his name to it, or seek royalties, license or payment, but made a free present of it to the industry, it has been worth the while of no one to protect the industry against the claims of those who have endeavored to supplant it, with the results now admitted by the Homestake and Portland metallurgists.

The zinc-dust claim to an entire clean-up is disposed of by such statements as that of A. H. Jones (Vol. LII, *Trans. A. I. M. E.*, p. 117) regarding his partially precipitated working solutions. Is it not a confession of waste that acid should so generally be used in the zinc-dust clean-up?

In the discussion on Kirke Rose's paper on the volatilization of gold (*Trans. Inst. Min. & Met.*, March 20, 1919), Sulman shows the heavy gold losses encountered in his use, at Day Dawn, Western Australia, of zinc fume as a precipitant, and the effort he made to overcome this. Picard later had a similar experience at Deloro, and, to avoid this, briquetted the precipitate with syrup. But the adoption of zinc dust distilled in a reducing atmosphere, plus the use of the Crowe process, has so increased the purity of the precipitate as to render fusion once more possible without previous acid treatment.

Precipitation of Silver

The efficiency of the standard process for the precipitation of gold by zinc shaving does not blind me to the point raised by Herz. Solutions used in the extraction of silver are so much stronger in cyanide, so high in alkalinity, so much richer in metal content, that one is forced to the use of much thicker shaving than that used with gold, or to some other method of moderating the violence of the reaction in the zinc boxes, with consequent heavy consumption of reagent and mechanical loss of fine precipitate. In the precipitation of extremely dilute solutions of gold it is ideal to have an excess of zinc in such form as effectively to precipitate the gold without wasteful reaction—that is accomplished by the present zinc-shaving system. In the precipitation of strongly alkaline solutions of silver it is ideal to have so little zinc as shall give the most effective precipitation possible without wasteful reaction—that is, not accomplished by the fine zinc-shaving method. Merrill's zinc-dust process has the advantage of a well-developed modus operandi using a deficiency of zinc; although, as I have previously stated (these notes, 1910), I prefer Colbath's modification. The placing in the market of zinc dust of high purity removed one of the worst objections to the use of the process on silver ore.

A great objection, avoided by Colbath, to the Merrill method, is the circulation of only partly precipitated solutions. To circulate such solutions in ore containing "fills" and decomposed sulphides is simply to invite loss.

I have referred to the Crowe process as the outstanding feature of the last few war-laden years. I can quite understand why some should inveigh in print at the Patent Office, but why should not a man be allowed to derive benefit from his application, to a new purpose, of an old known apparatus or method? I introduced the vacuum chamber to the cyanide process; I had no thought but of assisting filtration, nor until Crowe's message had I knowledge from any one of the great benefits which he has since proved to result from the application of his method. Advantage should not be

taken of an inadequate patent law, but due reward should be given to the man who has done so much to improve zinc-box practice and to relieve operators of the worry resulting from white precipitate and other troubles. The results reported from Mexico and elsewhere are remarkable. At one mine I find no saving in cyanide but an extraordinary reduction in the consumption of zinc to less than one kilo of zinc to one of silver. This may be overdone. The partly precipitated solutions at this mine carry double their previous silver content. It will probably pay to use a little more zinc and to lose a little less silver in circulation. But just as the dilution of solution was for a time overdone at the Robinson without detriment to the cyanide process itself, so the heavier silver content of certain solutions at Pachuca is no detriment to Crowe's discovery. The least amount of zinc for the greatest recovery of silver will adjust itself in time.

The shortage of cyanide has induced large operators to purchase a low-grade cyanide produced from cyanamide. J. G. Kirchen states his experience with this material (see *Eng. and Min. Journ.*, Sept. 25, 1920) on a month's run. I hope Mr. Kirchen will follow by giving his experience on at least a year's run. Faced at the outset with low-grade cyanide, works were erected, patents purchased, chemists of world fame employed, and ultimately an almost chemically pure article was produced. The proper remedy for a shortage of high-grade cyanide is surely greater production rather than the substitution of a low-grade compound, introducing much undesirable material.

Mexican Costs

By the courtesy of T. Skewes Saunders I am able to give some present-day costs at the Dos Estrellas.

COSTS AT THE DOS ESTRELLAS MILL

Milling, 1.20 in pesos per metric ton. Cyaniding, 2.00. On a basis of 1,000 tons per diem; or 3.20 pesos per ton from breaker bins to bullion bars.

Crushing (Blake)	0.0024	Handling slime and solutions	0.1271
Weighing and sampling	0.0208	Clarifying solutions	0.0215
Stamping	0.2814	Butters filter	0.1570
Tube mills	0.5987	Precipitation (Merrill-Crowe)	0.3441
Classifiers	0.0839	KCN (and other reagents)	0.7956
Tube-mill rock	0.0208	Concentration	0.0253
Laboratory	0.0211		
Thickeners	0.0170		
Agitation	0.1301		

To these costs are to be added, general expenses, taxes, and marketing of bullion.

The description of Bosqui's New Modderfontein mill by Weston (*Eng. and Min. Journ.*, Jan. 24, 1920,) reminded me of the publication by Bosqui of his paper in Vol. LII, *Trans. A. I. M. E.* At that time I was unable to read the paper or to comment on it, but I deprecate most strongly the unfairness of the practice observable in certain writings which seem directed to create an impression that the cyanide process grew up, like Topsy, without the care or attention of anyone, until it had achieved such great success as to cause large companies to be formed in Africa, Australia and America for the working of it, had settled the future of South Africa, and had converted both the enthusiastic champions of the rival chlorination processes.

Now all this meant initiative, courage, work and ability. But these writers would apparently have people believe that the conception, initiation, experiment, research, fostering care, and eventual triumph over the difficulties attending the introduction of an entirely new method in metallurgy all took place without the aid of MacArthur—at any rate he is not mentioned in this connection—and that the design, erection and successful starting-up and running of the pioneer Salisbury (refractory ore and concentrate) and Robinson (tailing) plants took place quite apart from myself. Even Hamilton, in his recent "Manual of Cyanidation" refers to MacArthur (see index) merely as the inventor of a zinc-lead couple. Surely it must be just want of thought; for able men like Bosqui and Hamilton, to whom the industry is under an obligation for valuable service, must be above the pettiness of intentional omission; and I feel assured that they will both be anxious to make ample apology and reparation now that the matter is brought to their notice.

The original design of the new mill at Modderfontein was subjected to severe strictures passed on it by the leading lights of the C.M.S. as a reversion to the condemned practice of laying down a plant liable to that enrichment of working solutions animadverted on by Butters (*Trans. Inst. Min. & Met.*, Vol. XIII, p. 77); an enrichment which was one of the causes of the abandonment of double treatment. Bosqui's knowledge of the evil effects arising from the enrichment of solution, resulting from the use of fixed submerged vacuum filters on rich material, must have warned him of the ill effects to be anticipated from any failure to keep his battery water unvitiated by contact with cyanide solutions.

But once more Bosqui has led the way to progress, not merely by his insistence upon absolute classification, air agitation, and filtration, but by adoption of most effective washing prior to crushing and grinding. Whether primary and secondary washing are really necessary I cannot yet say, but the milling increases resulting from the diversion (by washing or screening) from ball mills, stamps and tube mills of material already of the grade of the respective products, all go to prove Bosqui well advised, well inspired and absolutely correct. It will be observed that his system, with slight modifications, would lend itself admirably to the floating off or diversion of those fragments of wood which cause such trouble at Pachuca.

Mr. Söhnlein's reference to his furnace (*Min. & Sci. Press*, p. 688, Nov. 13, 1920), recalls the successful treatment in New Zealand of antimonial gold concentrate (referred to in these notes for 1906) by means of roasting in a reducing atmosphere, with special attention to the heat of the operation, followed by chlorination. A hand-rabbled reverberatory was used, and it was found necessary to roast in batches intermittently, each charge being kept separate from the next. On a similar problem arising later on in Rhodesia I patented (No. 957/13) there a furnace of the Merton type, in which reducing, oxidizing and chlorinating roasting may take place without any one of these roasts interfering with the operation of the other. I have not yet been able to investigate the working of Mr. Söhnlein's furnaces, but from his letter I should judge that his rabble work is novel and that his furnaces are effective.

The organizing of the Kolar Mining and Metallurgical Society is welcomed. India has been much too modest—or too disinclined—to publish technical papers, and yet, in the excellence of the sanitation of its underground workings and of its zinc-box (precipitation) practice, it has probably led the world. The new society should publish papers on the treatment of decomposed tailing heaps requiring oxidation; on the employment of "acid" versus alkaline solutions; and on the advantage of the basket (Moore) filter over the fixed-submerged (Thompson-Davies-Cassel-Butters-Moore) type.

The Development of the Silver Market*

A Short History of the Use of Silver in Monetary Systems and the Rise of London in the Market—Americans Manifesting an Increasing Interest in the Metal—The World's Silver Stocks Are an Important Factor in the Silver Situation, and an Open Market Is Desirable

BY C. W. WHEELOCK†

THE beginning of the fourteenth century is usually taken as marking the establishment of the monetary system of Europe. About that time the change from a currency system based entirely on silver to one which was bimetallic—based on silver and gold—became operative.

In their struggle to maintain their supremacy in the commerce and banking of the world, the Hollanders, about the beginning of the nineteenth century, developed the theory that if they could take away the money function, or right to unlimited coinage, from one of the precious metals, it would naturally increase the demand for, and the value of, the remaining one. The exploiting and development of this theory and practice constitute the real beginning of what we have now come to recognize as the problem of the "silver market." This occurred about a century and a quarter ago. During the intervening period, Holland, because and in spite of those who held this theory, has been on a silver basis; then on a bimetallic basis; again on a silver basis, and finally on a nominal bimetallic basis, though, more accurately, on a gold basis.

In the meanwhile England too had been studying money, its uses and effects, as well as developing her world trade, commerce, shipping, and banking. Although the English disagreed with the Hollanders, who were advocating a silver basis, they none the less indorsed the principle involved. They fully appreciated that if they could take the money function away from one of the metals, either gold or silver, it would make the other, slowly but correspondingly, more valuable—the while it enhanced the values of fixed investments such as bonds and mortgages. Further, through the favorable position England had acquired by the end of the Napoleonic era, as the world's creditor and banker, it would enable her to buy more cheaply in silver-using countries, and, at the same time, sell for relatively higher price, to the silver-using countries, her own products. Accordingly, in 1816, England, as the dominating financial, banking, trading, creditor and shipping country of the world, put this theory into practice, and went on a gold basis. In this position England had the "power to exact a settlement of the trade balance in gold alone instead of gold or silver at the debtor's option as heretofore."

Subsequent to 1816 the English gold theory made little actual progress until the early '70s, when Germany, France, the Latin union and the United States were put on a gold basis, from which time, 1873, the depreciation of silver began. The year 1873 is therefore the date of the beginning of the silver market as we know it, with all its fluctuations.

During the previous 200 years the average yearly price of silver, stated in terms of gold or the gold price, was about $1.35 per oz. Its lowest yearly average price was in 1813, $1.27. Its highest was in 1760, $1.46. The extreme average fluctuation in 200 years, quoted at the gold price for it, was therefore 19c. per oz. Since 1873 it has fluctuated 94 or 95c. Or, conversely, when prior to 1873 practically all the world except England was on either a silver or bimetallic basis, the price of gold, during the same 200 years, stated in terms of silver, varied from an average of $19.443 to $22.392 per oz.—or only 8.6 per cent. Today, when we frequently state the price of gold in terms of commodities, we know it has fallen 40 per cent or more in the last six years.

WHY LONDON CONTROLS THE MARKET

The market for silver is unlike that of any other commodity, unless an exception is made of gold. Markets of all other commodities are more or less localized. The market for silver is substantially world-wide, and in reaching the distributing points the question of rapid transportation, prompt handling and delivery, settlement of trade balances, banking, and insurance are all factors of great importance. It was therefore natural that England, the premier banking, insurance, trading, shipping, and distributing country of the world, should be able to become, subsequent to 1873, the great silver market of the world.

Further reasons are evident, owing to the demonetization of silver. America was not consuming its own output. Buyers for our surplus had to be found. This country had none of the facilities necessary for sale and distribution to other countries of the world, especially to China and India. On the other hand, London had every facility, so, perforce of circumstance, London naturally became not only the prime silver market of the world, but also the main distributer of the metal.

If in the handling of our silver the English and their dependencies have made more profit out of it than we as its producers have made, we simply have to admit they have been smarter than we have, without holding any grudge against them in consequence, for their statistics are available to any who care to study them, and a knowledge of their general theory, policy, and practice is open to all.

Prior to the Great War London "fixed" the price for silver each day. The price of silver, in London, is quoted in pence per troy oz. sterling, or 925 fine. In New York it is quoted in cents per troy oz. 999 fine. Hence the seeming difference in price under normal exchange rates.

The fixing of the price in London is done each day by the four concerns which compose the London silver market, namely Messrs. Mocatta & Goldsmid, Samuel Montagu & Co., Pixley & Abel, and Sharp & Wilkins. In some recent correspondence to which access has been accorded me, the statement is made that all transactions and the fixing of the price are confined exclusively to

*Read Dec. 8, 1920, at the meeting of the New York Section of the American Institute of Mining and Metallurgical Engineers.

†The author wishes to acknowledge the courtesies kindly extended him in the preparation of this article by Mr. A. J. MacQuatters, Messrs. Handy and Harman, officials of the Equitable Trust Co., the International Banking Corporation, the statistical departments of the Federal Reserve Bank and the National City Bank, the Director of the Mint and English correspondents.

these four firms, because of the fact that they operate "under patents from the crown."

The concerns named, or their representatives, meet each day at about 2 p.m., or on Saturday at 11.30 a.m., and with the data in hand as to supplies in stock and available, all the way from New York to London, Bombay, Calcutta, Shanghai, Hongkong and San Francisco, disclose to each other their buying and selling orders, without, however, disclosing their principals. On taking stock of the world situation, together with the day's requirements, and any other necessary items, the price for the day is then "fixed." Any excess of demand or supply determines whether the previous day's price is advanced or lowered. The dealings are closed on the day's official price so fixed. The fixed price is then cabled to the other markets. This fixed price in turn governs the prices at the other points, exchange rates, freights, insurance and trade balances being considered.

Two prices are fixed each day—one for "cash," that is for delivery within one week, at the option of the seller; the other price for "forward" delivery—two months from the date of sale. The spread between the "cash" price and the "forward" price depends upon a variety of factors. Options or "puts and calls" on silver are also freely traded in. The vendor pays no selling commission, but the purchaser pays a commission of one-eighth of 1 per cent.

Government Profits in Silver Coinage

The price of any article depends normally upon the demand for it. Until silver was demonetized the market for it was unlimited, and the price showed small fluctuation, as previously stated. Since it was demonetized its market has been limited to the demands from the industrial arts and to such amounts as the governments of the world have seen fit to use for coinage, together with any amounts required by China in settlement of trade balances.

Outside of the United States statistics of the quantities used in the industrial arts seem lacking. World estimates have been made all the way from 40,000,000 oz. to 120,000,000 oz. per year. Accepting even the top estimate, it will be seen that there still remains a considerable yearly surplus, probably averaging fully 100,000,000 oz., which acts as a depressing factor.

It is obviously to the advantage of any government to purchase silver for coinage as cheaply as possible, for the government makes the seigniorage, or the difference between the cost price and its circulating value. For example, the cost price may be 60c. per oz. After being coined it circulates at the rate of from $1.33 to about $1.45 per oz., according to the coining ratio. It will therefore be seen that if purchased at 60c. and coined at, say, a $1.35 rate, there is a profit of 75c. per oz. to the government doing the coining. On this basis the government makes considerably more profit than it has paid the silver miner for the bullion.

The governments are very canny buyers, as is shown by the following extract from a letter from a firm of London bankers: "Very soon after the start of the war the demand for coinage slowly absorbed the floating supply of silver. Purchases for the governments were pooled, and were made with such care that the price of silver did not act on it, but actually declined."

The Indian government and the Chinese bankers and merchants are the principal buyers of silver. In the last sixteen years India has absorbed an average of 45 per cent of the world's yearly production. In 1919 she took 112 per cent of that year's world production. In the last two to three years China has absorbed substantially an amount equal to two years' production. These excess demands were met by the Treasury of the United States, as a war measure. It is evident, therefore, that to a degree the price of silver is governed by the requirements of the Asiatics.

It is palpably not to the interest of the Indian government, which in turn is controlled by the British government, to pay a high price for silver. The Indian government has built up a gold fund reserve of about £35,000,000 from the profits from silver seigniorage. The government would be loath to give up this profit.

The Chinese people, like those of India, however, prefer a high price for silver, as it enables them to buy more abroad, as well as to receive higher prices for their own exports. This condition, however, is always combated by European interests which largely control the Chinese markets.

In addition to the purchases by the governments and by those who use it in the industrial arts, there is normally a large speculative position in silver. The foreigners have found silver to be an excellent medium of speculation. This speculation extends all the way from London to China.

Because of the fact that the United States alone of all the countries of the world had on hand a large stock of silver—which during the time of its accumulation had been the source of bitter argument and recrimination—we were able to come to the rescue at the time of the war crisis, and prevent an utter collapse in Asiatic, and also probably European, financial conditions. According to the Director of the Mint our "loss by conversion and sale" of this silver was in 1918 alone over $59,000,000. However, we saved a critical situation—even though in so doing we again bowed to London.

Increasing American Market Interests

There is now great satisfaction in knowing that certain large New York financial interests have recently become an important factor in the silver market, and are maintaining a most influential position with regard to it. These interests are entirely separate and distinct from any of the mining, milling, or smelting companies.

The concern that is now doing the largest silver-bullion business favors high, rather than low, prices for silver. This concern acts as broker, at a commission of $1 per $1,000, plus cable charges—or it will buy and sell for its own account. It also makes loans on bullion at a reasonable rate of interest. All this is a pronounced advance, so far as a silver market in New York is concerned. A still greater co-operation with these interests by miners outside of the United States would inure to the benefit of foreign silver miners.

In addition to the foregoing considerable work and investigation are being carried on by mining interests, with the view of attempting to create definitely a permanent open market for silver in the United States, hoping thereby to establish and maintain a high price for silver. As long as the Pittman Act remains in operation the producers of silver in the United States are assured of practically $1 per oz. If this act is not repealed or altered this condition will probably obtain about four years longer. Yet, four years in the history of silver is but a brief period.

In considering broadly the market for silver certain fundamental elements must be kept constantly in mind. All commodities may be roughly divided into two classes,

viz.: consumable and non-consumable. In the consumable class are all the ordinary commodities of commerce and agriculture, such as copper, coal, iron, wheat, cotton, and other necessaries. Substantially each year's product is either actually consumed, as are wheat and coal, or is locally utilized for some specific purpose, as are copper and iron. These consumable commodities are thus removed from the market. In the non-consumable class are the balance of the commodities, such as works of art, precious jewels, and precious metals that may be visualized as constituting a permanent stock on hand, to which small yearly accretions are made.

Therefore, in considering a market for either of the precious metals, gold or silver, due consideration must be given to the world stock on hand. Since 1860 there has been a world production of over twelve billion dollars of gold and over seven billion ounces of silver. As both metals have been produced for ages, no one can determine the actual stock on hand of either one. The world's silver stock may be divided into two classes, that which has been used in the arts and that which has been coined. At what price, or in what amount, silver that has been used in the arts will come on to any given market, or in what time, is wholly unknown and thoroughly problematical. However, it is estimated that about 20,000,000 oz. of "old silver" came on to the London market the first ten months of 1920. Part of this was from melted coins and the rest from the arts. It is believed that, owing to the prohibiting laws of the European governments and the seeming exhaustion of supplies, there will be little silver, at least from melted coins, coming on to the European market in the near future. What may come further from the arts is anyone's guess.

On account of this world stock of silver, statistics covering but one or two years' probable production and consumption are likely to be most dangerous and misleading. Only about a year ago these yearly statistical estimates seemed to indicate a shortage in 1920, according to those who made the several estimates, of from 40 to 155 million ounces. Based on these estimates, many people anticipated continuing high prices during 1920. The worth of such statistics and estimates for any single year without consideration of the world's stock and *many other factors of importance* is illustrated by the fact that foreign silver is quoted under 70c. per oz., instead of holding above $1.20, as anticipated.

Some authorities assert that the price of silver is governed by the price of Asiatic exchange; others that Asiatic exchange is governed by the price of silver. Under differing conditions either conclusion, it would appear, may be correct. As a matter of fact, the producer of silver, unlike the producer of other articles, never is allowed any voice or option in determining the price of his product.

Desirability of an Open Market

The world's yearly output of silver has recently varied from about 225 million ounces in 1911 to probably 150 to 160 million ounces in 1920. Citizens of the United States own and control about 75 per cent of the total. As only about 25 million ounces are used in the industrial arts in the United States, a considerable surplus is left, which has to find a market some place in the world. For this reason some preliminary work has been done, hoping to devise some means, probably through an open United States market, by which a higher price for silver can be maintained. It is highly problematical whether such means could, under existing conditions, succeed.

However, assuming there are adequate reasons for such an open silver market in the United States, would it not be preferable, if possible, to have silver listed on the New York Stock Exchange rather than attempt to establish it in an isolated market by itself? Considering the high esteem in which the New York Stock Exchange is held by many in the West, it will not be difficult to divine their reply to this suggestion. None the less, it must be borne in mind that it requires money and monied interests to handle silver in quantity and to deal with governments. Through the Stock Exchange access could be had to reasonable financial resources, and possibly assistance and co-operation in selling to foreign governments. Further, those who speculate would be afforded means of ample action.

All this on the hypothesis that silver will continue in the position it has occupied since 1873—part money metal, part ordinary commodity, a source of far greater profit to speculators and to governments than to its producers, whereas the method of utilizing it has been to the disadvantage, as well as to the oppression, of certainly more than one-half of the population of the world.

Silver as a Backing to Gold Reserves

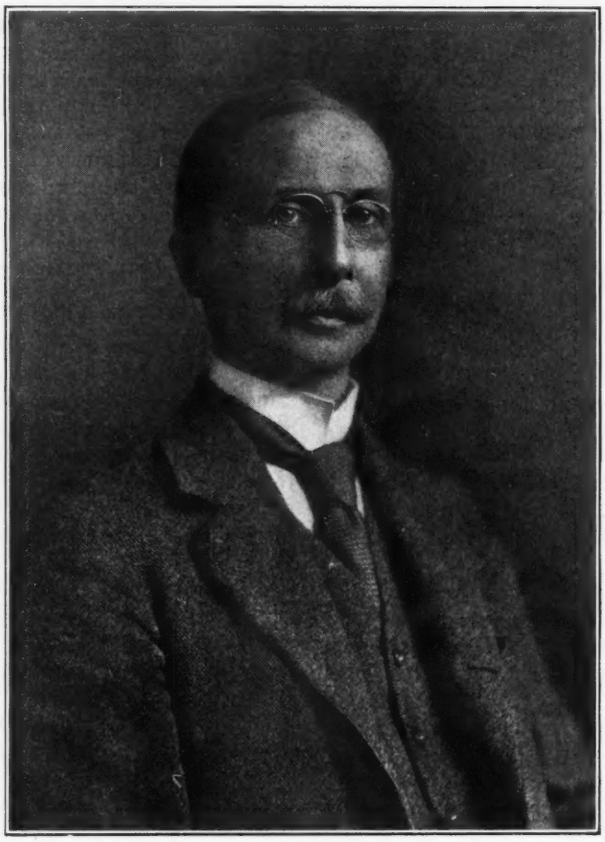
Silver, so long as it is primarily an article of commerce, will always fluctuate widely in price, and will undoubtedly continue, as bullion, greatly under the price at which it is current after coinage. The problem today would seem to be, more than ever, not what can be done for silver, but, rather, what can silver be made to do to help mankind? As pertinent to the problem, it is interesting to note that the national debts of the world have increased since the beginning of the war from 43 billion to 300 billion dollars. During the same time the amount of paper money has increased from 7½ billion dollars to 81½ billion dollars, while the total gold reserves have increased only 2½ billion dollars, according to statistics recently published by the National City Bank. The gold reserves of the world held against paper currency were 66.3 per cent in July, 1914. In November, 1920, they were 9.2 per cent. The gold reserves of Europe and India, but excluding any consideration of Russia, are but 5.2 per cent. There is therefore an inverted pyramid of national debts and currency, practically all calling for payment in, or conversion into, gold, amounting to about 380 billion dollars resting on a base of but 7½ billion gold—less than 2 per cent. In addition, the state, municipal, corporate and private debts are also payable in gold. The stack of gold has got to work more than union hours to keep this inverted pyramid from toppling over. Meanwhile the production of gold is falling off, which fact probably none appreciate as do mining engineers. It is just this situation that makes many bankers and economists pessimistic.

Fortunately for us the United States is in the strongest position as to gold reserves of all of the great nations. However, if unfortunately some of the others do have trouble, we shall not be immune from some of the consequences. In view of world conditions it would seem apparent that the question of silver and the market for silver should not be studied from the narrow point of view of better market and price for the metal and the miner. Rather does it behoove the governments and financial interests of the world to promptly study this largely unused assest, and to devise some means of better utilizing silver for the benefit of mankind, in lieu of kicking it as a speculative football.

Mining Engineers of Note

Robert Peele

ONE of the striking characteristics of many successful and prominent mining engineers is the highly varied succession of activities in which they have been engaged, which illustrates the versatility of the profession and warrants the inference that, although specilization is a desirable modern prerequisite to success, there is much of value in general experience. Robert Peele's career is no exception to the general rule. Graduating from the Columbia School of Mines in 1883, he acquired successively assaying and general mining experience (as most graduates do) in North Carolina and Colorado. After a year at this work he became foreman of the Silver King Mining Co.'s mill, in Arizona, where chloridizing roasting and amalgamation was being practiced. This position enabled him to acquire valuable training in mill work, although the reduction process employed is now obsolete. Then successively came an engagement as superintendent of a small silver mine in Horseshoe Gulch, near Fairplay, Col.; examination of mines in Arizona, New Mexico, and North Carolina, followed by an investigation of placer deposits in Colombia and Dutch Guiana. Respecting the work in Dutch Guiana Prof. Peele says: "Not a mile of railroad existed in the country at that time, and in carrying out prospecting work in three different gold placers areas, laborers, provisions, and supplies all were transported partly by launch but mostly by dugouts. After reaching in this way the nearest point to the concession to be prospected, the remainder of the journey was made on foot over trails cut through thick, tropical brush, the chief guide being a compass used in connection with rough and inaccurate sketch maps." The next jump was to a colder clime, for in 1889 as the superintendent of the Oregon Gold Mining Co. in Cornucopia, Ore., Mr. Peele became familiar with the destructive effects of snowslides in the Blue Mountains and their results on mining operations. From 1890 to 1892 he conducted examinations of gold, silver, tin, and coal mines for the Peruvian Exploration Syndicate, of London. As this syndicate was the subsidiary of the Peruvian corporation organized in the interest of the foreign bondholders of the Peruvian railroads which at that time occupied an important place in the political and commercial life of the country, a splendid opportunity was given him to become acquainted with the mining regions of certain parts of the West Coast of South America. His field was broad, necessitating constant travel, and extended far into the interior of Bolivia, Peru, and Colombia. The interesting silver mining districts of Colquechaca and Porco, Bolivia, and numerous undeveloped tin deposits in the elevated region to the east of Oruro, were examined—elevations ranging from 14,500 to 16,000 ft. Work of similar nature took Professor Peele close to the district now made famous by the copper mine at Chuquicamata. Many of these trips were extended muleback journeys—one to Cochabama was particularly long and arduous then, although easily made by rail today. Other examinations were made in Peru in the Callejon de Huaylas district and vicinity, also in a remote region east of Bucaramanga, Colombia, near the Venezuelan border. Considering the wide experience in mining which Mr. Peele's career had afforded him, it was no wonder that he was invited to accept the post of adjunct professor of mining at Columbia University, a tender that he accepted in the fall of 1892. However, his professional work partly continued. In 1896, the firm of Olcott, Fearn & Peele was organized, afterward Olcott, Corning & Peele, consulting mining engineers.



ROBERT PEELE

Not contented with his globe trotting up to this stage of his career, two circuits were subsequently made around the world. In 1910 a trip was taken to the Transvaal and the Kimberley diamond mines of South Africa, returning via South America.

Professor Peele has made two notable contributions to engineering literature, the first, "Compressed Air Plant," now in its fourth edition, and the second, "The Mining Engineer's Handbook," an exceedingly useful volume which represents a great amount of labor on the part of his associates and himself. Articles on mining subjects in the Encyclopædia Britannica are also the work of his pen. Professor Peele is widely known and honored as one of the foremost authorities upon mining matters.

By the Way

Keno Hill

History seemingly repeated itself at Keno Hill, the scene of the important silver discovery in the Mayo area, in Yukon Territory, about 150 miles west of the great gold center at Dawson. One is reminded of the early days at Leadville, where the placer miners in California Gulch cursed the heavy carbonate of lead that impeded their washing operations, not knowing its nature or its valuable silver content. In similar manner, prospectors, led by the lure of gold years ago to Duncan Creek, at the foot of Keno Hill, ignored the galena float they found in their sluice boxes and eventually passed on, leaving their chance to fame and fortune behind them. It remained for Louis Beauvette, a seasoned prospector, to discover the rich silver ore and stake the discovery claim, on July 10, 1919, on the hill where years before he had often hunted the mountain sheep. Over 500 claims have been staked. Keno Hill is a wedge-shaped ridge about eight miles long and five mile wide lying between creeks, according to Dr. Cockfield, of the Dominion Geological Survey. Its northern slope is rugged, even precipitous in places, and the southern slope is gentler, being controlled by the dip of the strata. The rocks exposed are schists and gneisses cut by greenstones and smaller bodies of quartz porphyry and granite porphyry. The main veins of the hill striking N.30-40 deg. E. and dipping 50 to 70 deg. southeast are persistent for considerable distances and are cut off by a series of transverse fractures at an angle of about 70 deg. The most extensive work to date has been done by the Yukon Gold Co., which secured options just after the first few claims were staked, since which time it has taken over the six central claims on which silver was first found. These are to be developed by a subsidiary company known as Keno Hill, Ltd. The warning given by a writer in the *Dawson News* is worth repeating. "The development of a rich camp like Mayo is certain to attract speculators of a kind who will be more anxious to obtain options and float companies on terms more beneficial to themselves than conducive to the welfare of the country."

You Can Dine Well in Yukon

Childrens' restaurant is our pet aversion, and in our lighter moments we are fond of comparing the menus of other establishments far and near with that which it puts forth. In the last two years we have heard how miners were leaving Alaska and other parts of the North; how costs were mounting and conditions steadily worsening. Perhaps things have taken a turn for the better. At any rate the Arcade Café, in Dawson, puts forth a menu, an "All-Yukon" menu it calls it, which compares more than favorably with many New York bills of fare. To quote from it, chicken à la Eldorado is but a dollar a throw; Bonanza Basin dill pickles and Quartz Creek pickles two bits a portion each. Boiled Yukon salmon, baked Galena Creek greyling, or fried Tullibee, the latter with Twelvemile silver chips, may be had for six bits each, to say nothing of the All-Yukon dinner for the same price. Among the *entrées* are grilled caribou steak with Mount Rambler mushroom sauce at six bits and Lookout Mountain moose steak with bacon at a dollar. Grilled Keno Hill ptarmigan, à la Axel Erickson, is more expensive at a dollar two bits. Leg of Sixtymile caribou with wild current jelly is listed at six bits, and Duncan Creek grouse, à la Louis Beauvette (Louis discovered Keno Hill), at double the price will conclude the recital, though the half has not been told. The Arcade calls itself "the most famous restaurant of the Land of the Midnight Sun—Mecca of the tourist and home of the sourdough—Headquarters of the All-Yukon dinner, the meal that keeps the money at home, and proves that Yukon is the great food-producing belt of the continent."

Comparatively Warm

Keno Hill enjoys a climate that, though not exactly comparable with that of Palm Beach or Bermuda, is such that some in the Far North consider it a not unpleasant place to be in. There, it is said, the temperature seldom ever registers more than 15 to 20 deg. below zero in winter, though in the valleys below it drops in cold spells to 50 and 60 below or even further, sometimes reaching a point where no doubt even the currency contracts. In spite of its mild climate, however, there will be many who will wait till warmer weather before rushing to the district.

An Episode of the North

The romantic adventure of the three naval balloonists, who were blown by a blizzard from the vicinity of New York to the southern shore of James Bay and at this writing are making their way by dog team back to civilization, has focused the attention of all upon them, and their story is eagerly awaited. Newspaper men and photographers have hastened to meet them. It is therefore with some distaste that one reads in the day's paper that Secretary Daniels has wired the ballonists to say nothing of their adventure until their statements to the Navy Department have been received and given to the public. One is reminded of the master of ceremonies at a ball, who to display his authority over the musicians ordered them to stop at the height of the dance. Then he informed the guests that dancing might be resumed; but nobody danced.

A New Oil Rush

A mechanical engineer in building air castles might be forgiven if he inadvertently reached the conclusion that because this old globe revolves so smoothly there must be a lot of oil around the poles. However this may be, there is a rush up toward the Arctic Circle again. This time it is for oil, not for gold. Prospectors are heading for the Mackenzie River to the new oil field at Fort Norman. Although winter is closing in, hundreds of adventurers are said to have set out with pack trains and dog sleds to stake claims before the rush starts in the spring. Indeed, it looks as if the rush had already begun. In order to protect the foolish against themselves the North West Police are forbidding all to continue who are not fit or adequately provisioned.

On the Kougarok

Of the Kougarok River near Nome, Alaska, it is said that he who drinks of its waters never tells the truth again. The miners who once swaggered about the Kougarok diggings drew on their imagination so liberally in dealing with others that the saying arose "Divide by eight what the Kougarok miners say."

CONSULTATION

Quotation Comparisons

"As you are aware, we have always been somewhat critical of the prices appearing in the *Engineering and Mining Journal* as compared with other current quotations for copper in New York, and recently this disparity has been so marked we feel we should like to have some explanation. To our knowledge the journal in question has on more than one occasion, owing to complaints, endeavored to explain the justice of its quotations, but evidently not to general satisfaction, as the complaints appear to have been renewed from time to time.

"We have taken out a list[1] of quotations of electrolytic copper from the Nov. 1 issue, and those given in the London *Financial News* based on cables from New York, which quotations we may say we have verified from time to time, with the cabled New York prices given in other papers, such as the *Times*. You will see that the *E. & M. J.* prices are invariably below the others, and in the last quotation, that of Dec. 1, the *E. & M. J.* price is given as 13.25c., against the mean cabled figure of 13.875c. The lowest price mentioned here recently was a reported sale at 13⅜c., which was lower than the quoted figures, but this was recorded as an exceptional instance, and even so this price is above the 13.25c. quoted by the *E. & M. J.*

"The statement made by the *Engineering and Mining Journal* that its prices are an appraisal based on the results of actual business done in the major markets is taken into account, but even so we cannot understand why there should be so marked a difference, as current quotations must surely reflect the course of business which has happened (nominal quotations excepted), and taking into account forward sales, which under usual conditions command higher prices, we cannot see how these lower quotations of the *Engineering and Mining Journal* are justified. 'Spot' transactions generally command the lowest prices, but a considerable margin between these and the *E. & M. J.* figures always appears to exist, although presumably their prices cover both 'spot' and 'forward' sales."

The London metal dealer who was instrumental in forwarding the above letter informs the *Engineering and Mining Journal* that "a large number of contracts for the sale in America of copper-bearing material are based upon the copper quotations appearing in your journal," so that the following explanation may prove illuminating to other interested metal producers abroad besides the South African producer making the inquiry:

Copper, unlike other metals, is commonly quoted on a "delivered" basis, the seller paying the freight charges to the consumer's plant. However, in order to have the metal quotations all on the same basis, copper is quoted, in the regular table of the Market Section, f.o.b. New York refinery. It has been decided, after proper investigation, that the delivery charges will average about ¼c. per lb., so that for the time being this amount is deducted from the delivered prices as reported to us. Recently, below the table, the delivered price is also quoted, so that there can be no misconception. Other publications almost invariably quote the delivered price, which is about ¼c. more than the seller actually receives after deducting transportation charges. This, therefore, accounts for ¼c. of the difference.

[1]The list is not printed here for lack of space but compares London *Financial News* and *Engineering and Mining Journal* quotations.

Further, *Engineering and Mining Journal* prices represent actual sales, and not strictly quotations. Recently, for example, sellers of possibly 75 per cent of the American copper production have been quoting 14c. per lb. and unwilling to sell at the prices, around 12½c., realized by smaller interests. When these quotations are purely nominal and no sales at such prices are made, they are neglected utterly. This fact has a tendency to make the quotations lower than those published elsewhere.

Most other quotations are reported daily and are obtained by inquiring from one or more selling agencies for the price at which they are holding copper. It is to the interest of metal producers of course to have such published quotations high, so that a cut under those prices will prove more attractive to an actual purchaser. The quotations published in the *Engineering and Mining Journal* are a review of past sales, and do not appear until from one to eight days after business has been consummated, so that sellers do not have the incentive to influence the market by misleading quotations. All of the facts above set forth tend to make *Engineering and Mining Journal* quotations lower than others, particularly in a declining market such as the recent one.

A word as to how these prices are obtained: Once a week producers and consumers in New York supply confidential information as to what they have sold or bought during the preceding week. In general this information is given to no one else, and is given only on condition that no confidence is violated, but that the information is only used to arrive at just quotations. Producers and consumers tell us that they do not give this same information to the financial papers and the daily press, which must, therefore, depend on gossip and on the quotations of the New York Metal Exchange, on which comparatively little business is done. Sales made for delivery far in the future and sales made at contract prices we are disposed to neglect. Prices therefore represent the figures at which metal was actually sold for early delivery in the open market. Sales are weighted as to quantity, and a lot of 1,000 tons at 12½c. is given ten times the consideration that a sale of 100 tons at 13c. receives. This also tends, in many cases, to make our prices seem low. The sales information given by our informants is often automatically checked, that is, a sale reported by a metal producer is reported by a consumer as a purchase.

The *Engineering and Mining Journal* is neither owned, controlled nor edited by anyone having any interest in the metal markets other than that high prices make the mineral industry more prosperous, which of course would redound to the advantage of this publication. Certainly, therefore, we have no reason for quoting prices lower than are justified.

The best way in which *Engineering and Mining Journal* quotations can be checked is to compare them with an actual record of sales or purchases, as the case may be. A comparison with other quotational services will almost always show marked discrepancies, as the press in general is not supplied with the sales information given to this publication.

THE PETROLEUM INDUSTRY

Texas Advances to First Place Among November Oil-Producing States

THE following statistics of the production of petroleum in the United States east of California in November, 1920, and the two preceding months, based on reports filed with the U. S. Geological Survey, show the quantity of oil removed from producing properties by pipe-line and other marketing companies and by refineries that receive petroleum through private pipe lines or in tank cars or boats directly from the wells. Data concerning oil consumed on the leases and producers' storage cannot be obtained in time for use in the monthly reports, but are used in compiling the annual figures showing production. The production reported for California is the average shown by figures checked. Losses are recorded in stocks of other domestic grades.

The event of the month in domestic production was the increase reported for Texas, amounting to a daily average of more than 17,000 bbl. Texas accordingly advanced from third to first place, surpassing Oklahoma and California. Among the smaller producing states Montana went ahead of Indiana and New York. Increased rates of production are also reported for California, Kansas, Louisiana, West Virginia, and Illinois; decreased rates are recorded for the other states.

During the first eleven months of the year 409,000,000 bbl. of petroleum was produced in the United States,

PETROLEUM PRODUCED IN THE UNITED STATES IN SEPTEMBER, OCTOBER, AND NOVEMBER, 1920

(Barrels of 42 U. S. gallons)

State	September, 1920 — Total	September, 1920 — Daily Average	October (a), 1920 — Total	October (a), 1920 — Daily Average	November, 1920 — Total	November, 1920 — Daily Average
Central and Northern Texas	5,743,000	191,433	6,659,000	214,806	6,714,000	223,800
Coastal Texas	2,144,000	71,467	2,619,000	84,484	2,775,000	92,500
California	9,128,000	304,267	9,459,000	305,129	9,340,000	311,333
Oklahoma	9,093,000	303,100	9,437,000	304,419	9,031,000	301,033
Kansas	3,615,000	120,500	3,601,000	116,161	3,578,000	119,267
Northern Louisiana	2,644,000	88,133	2,511,000	81,000	2,462,000	82,067
Coastal Louisiana	132,000	4,400	150,000	4,839	153,000	5,100
Wyoming	1,573,000	52,433	1,676,000	54,065	1,340,000	44,667
Illinois	903,000	30,100	872,000	28,129	846,000	28,200
Kentucky and Tennessee	766,000	25,533	761,000	24,548	734,000	24,467
West Virginia	672,000	22,400	673,000	21,710	656,000	21,866
Pennsylvania	626,000	20,867	646,000	20,839	603,000	20,100
Central and Eastern Ohio	453,000	15,100	446,000	14,387	437,000	14,567
Northwestern Ohio	187,000	6,233	182,000	5,871	165,000	5,500
Montana	37,000	1,233	56,000	1,807	92,000	3,066
Indiana	86,000	2,867	85,000	2,742	81,000	2,700
New York	78,000	2,600	82,000	2,645	75,000	2,500
Colorado	9,000	300	9,000	290	8,000	267
Totals	37,889,000	1,262,966	39,924,000	1,287,871	39,090,000	1,303,000

(a) Revised.

collected by the Standard Oil Co. and by the Independent Producers' Agency and includes all petroleum brought to the surface.

The daily rate of production of petroleum in the United States continued to increase during November and attained the record of 1,303,000 bbl., making a total for the month of 39,090,000 bbl., almost seven million barrels more than in November, 1919. Imports during November also reached the highest mark yet attained, amounting to 13,750,199 bbl., an increase of more than two million barrels over the imports during October and of almost nine million barrels more than in November a year ago. Consumption, however, did not keep pace with the increase in petroleum available; instead there was a slight decrease in total consumption of crude oil as compared with October, and stocks were increased more than three million barrels. Stocks of domestic petroleum were increased by 2¼ million barrels and stocks of Mexican petroleum held by importers in the United States by almost one million barrels. Large gains were made in stocks of Oklahoma-Kansas and North Central Texas grade and of Gulf Coast grade, and the steady decrease of California stocks that has persisted for so many months is reported to have been as compared with 345,000,000 bbl. during the corresponding months of 1919. It seems assured, therefore, that 450,000,000 bbl. will have been produced in the United States during 1920, an increase of more than 70,000,000 bbl. over the output in the year 1919. The outstanding facts of 1920 in regard to crude petroleum in the United States have been not only the record-breaking production but the even greater increase in rate of imports and consumption.

Oil Indications in Uruguay

Investigations for oil have been carried out in Uruguay by the Instituto de Geologia y Perforaciones, according to *Commerce Reports*, and indications have been found in various parts of the republic, notably in the northern and northeastern parts, where the oil-bearing or bituminous strata of southern Brazil extend into this region. Borings have been made near the city of Melo to a depth of nearly 1,640 ft., piercing sedimentary strata of shale and sandstone. At a depth of about 500 ft. flows of water were encountered having a strong odor and taste of petroleum.

NEWS FROM THE OIL FIELDS

Wildcat Drilling in Harris County, Tex.

From Our Special Correspondent

Some wildcat drilling is now being done that is of considerable interest. The Willow Creek Oil Co. has brought in a gas well near Louetta, Harris County, twenty-six miles northwest of Houston. The gas was struck at 1,400 ft. and was under sufficient pressure to blow the mud from the hole. Deeper drilling will be done to test for oil. The East Houston Syndicate has been organized to drill on company ground just north of East Houston. It is said there is a gas showing there and every indication of a dome. Besides work on these coastal wildcats, work will be resumed by the International Oil Co. on its well in Maverick County near Eagle Pass. The well is 3,150 ft. deep, and is said to have shown considerable oil when bailed. Equipment has been installed capable of drilling to a depth of 4,000 ft.

Several new producers have been completed recently in the Hull field, and at West Columbia there have been few new completions and the Texas Co.'s No. 49 Hogg well and two of the Humble Oil & Refining Co.'s Japhet wells, three of the largest producers in the field, have sanded up. Although the production in this field has fallen off considerably, construction is under way, including a tank farm by the Texas Co. covering fifty acres, and an electrically equipped pumping plant by the Humble Oil & Refining Co. The only completion of importance at West Columbia recently is the No. 1 well of the Big Belt Oil Co., flowing 2,000 bbl. This well is between the old field and the north extension.

At Blue Ridge, the Texas Co. finally succeeded in reopening its No. 1 Robinson well, but it is making only 100 bbl. per day. This is the well that came in as a big gusher and lasted only a short time, but caused the present intensive campaign of drilling by a dozen or more companies. In one well, the No. 1 Bentley of Jerry Kinney et al., salt has been struck at a depth of 2,780 ft.

Senator McKellar Introduces Oil Protection Bill

A bill to protect the oil resources of the United States and which asks reciprocity on oil and shale deposits between the United States and other nations which make no restrictions upon the exploitation by Americans of petroleum within their dominions, and retaliation against such nations as discriminate, was introduced on Jan. 3 by Senator McKellar, Democrat, of Tennessee. The bill was referred to the Foreign Relations Committee.

Sixth Completion Made by Iowa-Wyoming Company in Wyoming Field

From Our Special Correspondent

The Iowa-Wyoming Oil Co. has just completed its No. 8 well in the Bolton Creek field, making an initial production of 100 bbl. daily from 1,065 ft. This is the sixth completion by this company in this field. Two other wells are ready to be drilled in.

It is reported that the Pahaska Syndicate has struck oil at about 445 ft. on its lease three miles east of Cody.

The Midwest Refining Co. has a flow of 10,000,000 cu.ft. of gas from its well on the Golden Eagle dome near Thermopolis. The gas is coming from 2,475 ft., and an attempt is being made to shut off the flow so that deeper drilling can be done. Other gas flows have been found in this district at 2,110 and 2,185 ft.

The Salt Creek Producers' Association has declared its initial quarterly dividend of 1 per cent and an extra of 2 per cent payable Jan. 31 to stockholders of record Jan. 15.

Mexican Oil Notes

From Our Special Correspondent

The Indiana Mexican Petroleum Corporation brought in its first producer in the Mexican fields recently. It is known as the company's No. 1, on a fraction of Lot 134, Chinampa. The pay was struck at a depth of 1,907 ft., making it one of the shallowest wells in the field. The estimated flow is 30,000 bbl. daily.

The Transcontinental Petroleum Co.'s well on Lot 198, Amatlan, is still blowing gas and a spray of oil, and consequently it is difficult to drill. It is expected that the oil will be encountered in the next five feet. The well has over nine hundred pounds' pressure on it, which is rather high for the district. The depth of the well is now 2,028 ft.

The work on the Transcontinental Co.'s pump station on Lot 214, Amatlan, is progressing rapidly, and it is expected that it will be in operation within the next four months. There will be fourteen pumps with twenty-eight boilers to furnish the steam. The estimated capacity of the plant is between 250,000 to 300,000 bbl. of oil daily. This will be the largest pump station in Mexico.

Much of the drilling in Zacamixtle is being held up on account of litigation. This will probably regulate the extensive drilling program and add a few months of life to the pool, which promises, from present indications, to be one of the largest in Mexico.

The deep test of the Azteca Co. on Lot 188, Amatlan, is changing from standard to rotary tools in order to carry the hole down to 4,500 ft.

Many Good Strikes in Old Areas of Kentucky

From Our Special Correspondent

In Lee County, Ky., where most of the eastern Kentucky development is centered, the Petroleum Exploration Co., drilling on the Rogers lease, has two 10-bbl. wells, as has also the superior Oil Co., drilling on the Hall-Burke lease. The Southwestern Petroleum Co., drilling on the Lyon lease, has a 15-bbl. well. The Ohio Fuel Co., on the Smyth lease, has a well of 50-bbl. estimated capacity.

In western Kentucky, the Warren County field shows a number of wells making up to 100 bbl. In the Davenport pool the Big Jack Oil Co. is reported to have a showing for 200 bbl. in its latest puncture on the Charles Davenport lease. Activity in western Warren has extended into Todd and Logan counties, each of which is now undergoing a thorough test. The latest completion reported from Logan County was an advance test drilled on the Wilhelm lease, making 15 bbl.

Simpson, Allen and Barren counties are receiving more attention than ever, Simpson especially with respect to lately completed work. Two new completions on the Mitchell lease are reported to have a showing of 100 bbl.

In Barren County, on the Myers lease, the Elam Oil & Gas Co. has a 25-bbl. producer. A pipe line will be extended from the Woodson production to Glasgow, where a loading rack will be built.

The Grande Prairie Oil Field

From Our Special Correspondent

The Imperial Oil Co. has leased 30,000 acres near the British Columbia boundary to the west of Grande Prairie, Alberta. Its holdings are located along both banks of the Pouce Coupe River, a tributary of the Peace River, extending for fifteen miles along either bank. The new field forms as it were a bay, or valley, in the eastern foothills of the Rocky Mountains, and according to gelogists shows similar characteristics to the Caspar, Wyoming, field. It is estimated that the new field covers an area of approximately forty by sixty miles. Since the Imperial Oil Co. placed its filings, from sixty to seventy thousand acres have been filed on by other corporations and individuals. The Imperial Oil Co. has two drilling outfits in transit from Edmonton, and it is reported that several outfits are being moved down from Peace River to the new field.

Recent dispatches from Athens state that Great Britain has been given concessions in newly discovered oil fields in northern Greece.

Book Reviews

The Cost of Mining. By James R. Finlay. Cloth; 6¾ x 9¼; pp. 532; third edition; charts and tables. McGraw-Hill Book Co., Inc., New York. Price, $6.

Mr. Finlay states in his preface to this edition that some doubt existed as to the fitness of the title of the book, but we are glad to note that it remains the same as that of the two previous issues. The inclusion of the several discussions of economic features of the industry makes the volume a particularly strong presentation and one which will appeal not only to those connected directly with mining but to those associated in any way with the industry. The former issues dealt more particularly with the technical side of mining costs; in this issue the author has dealt with the subject in a broader manner and has not only given the reader the benefit of his wealth of experience in the mining business under diverse conditions, but has also presented a liberal interpretation of the importance which may be attached to the economic factors concerning the industry.

The early chapters of the book are devoted to broad discussions of the economic influences of the industry, the basis of valuations of mines, financial considerations and cost analysis. The remaining chapters deal with the production of specific minerals, their costs and relation to the world's business.

D. E. A. C.

Derecho Minero Cubano. By José Isaac del Corral. Paper; 7 x 10½; pp. 675. Tomo I. Published in Spanish by Sociedad Editorial Cuba Contemporánea, Habana, Cuba. Price, $5.

This is the first of three volumes. It is a compilation of laws and regulations on Cuban mining law from the earliest period up to date, and covering the requisition and working of mining property of every description. The work likewise discusses the mining laws of other countries and the origin of Cuban practise.

A Textbook of Chemical Engineering. By Edward Hart. Cloth; 6 x 9; pp. 211. Published by the Chemical Publishing Co., Easton, Pa. Price, $4.

This book is evidently written for the purpose of familiarizing students in their earlier courses in chemical engineering with some of the machinery with which they will come in contact. It embodies short chapters on the following topics: Materials, Location of Works, Boilers, Prime Movers, Plumbing, Crushing, Dissolving, Filtration, Tanks, Evaporation, Crystallization, Drying, Distillation, Absorption of Gases, Mixing and Kneading, and Containers. As the book contains about 200 illustrations and only 211 pages, the space left for discussion of all of these subjects is necessarily limited. The treatment is, therefore, incomplete and decidedly sketchy. The author does not attempt to go into the theory of the processes to any notable extent or to discuss the comparative virtues of the machinery described, but in general merely uses information gained from manufacturers' catalogs and articles published in the technical press and handbooks. We think too large a proportion of the text, in consequence, is quoted matter.

As an elementary textbook—and it is only fair to say that this is all the book purports to be—this work of Dr. Hart's will no doubt be acceptable. The field remains wide open, however, for some one—and he will need collaborators—to write an authoritative book on chemical engineering which will be complete, modern, and a valuable reference for the practicing engineer. E. H. R.

Annual Statistical Report for 1919 of the American Iron and Steel Institute. Cloth; pp. 96; 6¾ x 9½; tables. Issued by the American Iron and Steel Institute, 61 Broadway, New York.

This eighth annual report contains the statistics of the iron and steel and allied industries of the United States and Canada for 1919 and preceding years. Among the compiled tables are those relating to the production of pig iron, steel ingots and castings, rolled iron and steel, tin plates, galvanized sheets, pipes, tubes, nails, rail joints, and charcoal blooms, the production and shipments of iron ore, coal and coke, miscellaneous production statistics, imports and exports, average monthly and yearly prices and statistics for Canada. As a reference book, this little volume will prove invaluable to those interested in any of the industries relating to iron and steel production. Although the included tables have already been published in bulletin form either by the Institute or other credited sources, the collection of them in this convenient form will be greatly appreciated by all interested in the industry. D. E. A. C.

The Platinum Metals. By A. D. Lumb. Paper; 5½ x 8½; pp. 63. John Murray, 50 Albermarle Street, W. London. Price, 3s. 6d.

This paper gives the occurrences, characters, uses, production and sources of supply of the platinum metals and contains a bibliography upon the subject. It resembles in outline the paper on platinum prepared at Washington as part of the "Political and Commercial Control" series, but is considerably more detailed, particularly in its treatment of foreign platinum deposits. It is published by the Imperial Institute, a British organization which is a center for the exhibition and investigation of minerals with a view to their commercial development and for the supply of information respecting the sources, composition, and value of minerals of all kinds. The paper brings the subject up to date and gives much valuable information.

Technical Papers

Ontario Mining—Part I of the Ontario Department of Mines report for 1919 has been published and is obtainable on request to the Department at Toronto. The volume includes a statistical review; a list of mining accidents in 1919; short descriptions of all the mining operations in the province; the second report of the Joint Peat Committee; the results of a geological reconnaissance into Patricia; a report on the Windy Lake and other undeveloped nickel areas; and a chapter on Haileyburian intrusive rocks.

Queensland Mining Industry—The annual report of the Under Secretary for Mines for the year 1919 has been published and is obtainable on application to the Department of Mines, Brisbane, Queensland. It is a very complete book. A large colored map of Queensland showing the mining districts is a feature.

Oil Shale—In the Bulletin of the American Association of Petroleum Geologists (Vol. IV, No. 2, 1920) appears a paper, "Notes on the Oil Shales of Southwestern Wyoming," by E. F. Schramm. The article deals entirely with the oil-producing shales of the Green River formation, and one section, totaling 1,784 ft. in thickness, is completely classified. Results of distillation of samples are given. In addition, twelve other sections showing the position and thickness of the shales are plotted. The paper is illustrated with photographs of typical outcrops.

Slate Mining—The U. S. Bureau of Mines *Reports of Investigations*, Serial No. 2,181, has five pages devoted to slate mining in Maine in the vicinity of Monson. The deposits are unique and demand special methods of operation. The bulletin is free.

South Australian Mining—A review of mining operations for the first half of 1920 has been published by the Department of Mines, Adelaide, South Australia; obtainable on request.

Manganese—A report on the manganese deposits of Horseshoe Range, Peak Hill Goldfield, Western Australia (thirty-one pages), may be obtained from the State Mining Engineer, Perth, Western Australia. The deposits so far have not been worked, but it is estimated that 1¼ million tons of ore of marketable grade could be secured from the top crust of these deposits.

Ontario Gold—Part IV of the twenty-ninth annual report of the Ontario Department of Mines (Toronto, Ont., free on request), is a fifty-three-page pamphlet devoted to the Kirkland Lake gold area. This is next to Porcupine in importance as a gold producer in Ontario. Estimates place the 1920 production at one million dollars. Most of the gold occurs native and is recovered by the cyanide process. Flow sheets, maps, colored plates, and sketches are given.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Conditions at Colorado School of Mines as Seen by a Graduate in Residence

System of Trusteeship Blamed—Would Put School Under State University—Urges Alumni To Act

In the December, 1920, issue of the *Colorado School of Mines Magazine*, C. Erb Wuensch, the editor of that publication, calls attention to the existing conditions, as he sees them, at the Colorado School of Mines. The following quotation from p. 231 of that magazine presents Mr. Wuensch's views:

"Conditions are fundamentally wrong at Golden and require immediate correction. The present system of trusteeship by appointments made by the Governor has had a long trial and been proven a failure. The reason is because of the difficulty of selecting men of the proper character—men free from local prejudice—who possess the proper educational ideals. The only immediate solution lies in placing the school under the authority of the regency of the University of Colorado. If this is done, you will then be able to secure the services of a proven executive for president, and you will be able to attract and retain efficient teachers from other universities. Some will object to this because they imagine this would result in the Colorado School of Mines losing its individuality. This suspicion is born of ignorance; many of the other schools of mines are under the authority of their state universities, and yet they have retained their identity. Others in all honesty maintain that the regents are virtually political appointees; they are elected by the people instead of being appointed by the Governor, as are the trustees. They, therefore, cannot see how this would remove the influence of politics. Experience has shown that this system works, just as it has shown that our system is a failure. The reason is that the people have a voice in the selection of the regents. If undesirable candidates are nominated, the alumni of the various schools have an opportunity to organize an effort to bring about their defeat.

"We would suggest that all the state's schools be put under one board of regents; thus all prejudices would be appeased and many economies could be effected which would accrue to the benefit of the state.

"I have attempted to speak the truth regardless of consequences. I have called 'a spade a spade,' because I felt that any half-hearted statement of facts would fail to arouse the association from its lethargy. The reason for this indifference is quite evident to one from within—conditions at Golden are so nauseating, and the school has received so much unpleasant notoriety of late that they hate to have a hand in the affair. The hour has arrived when the association must either stand up to attain the ideals for which it was formed, or else disorganize at once. I fully appreciate the value of the association in this regard as well as a means to enable the graduates to keep in touch with one another, and the school's activities, so as to perpetuate the memories of their school days, as it were. It was from these motives that I assisted in reviving the Alumni Association in January, 1919, and later took over the editorship of the magazine. There is not sufficient compensation to make it worth while to do this work, and if it were not for the fact that I have sufficient outside activity to keep me busy, with which the Alumni Association work does not interfere, I could not have afforded to have done this. If the Alumni Association cannot unite in an effort to bring about these fundamental changes, I cannot further sacrifice my self-respect to be identified with it as editor of its magazine or as its assistant secretary-treasurer."

Mining and Metallurgical Society Holds Annual Election and Dinner

Lindgren, Retiring President, Announces 1921 Medallist—Kemp and Mathewson Speak—Spurr Elected President

The annual meeting of the Mining and Metallurgical Society of America was held on Tuesday, Jan. 11. In the afternoon session the postal ballot for officers was reported, and other business matters of the society were despatched. In the evening a smaller number of members attended the annual banquet at which the retiring president, Prof. Waldemar Lindgren, of the Massachusetts Institute of Technology, was master of ceremonies. His remarks reviewed the progress of the study of ore-deposition during the past few decades. Prof. Lindgren also announced that the 1921 medal of the society had been awarded to Charles W. Goodale, director of the Anaconda company's bureau of safety, for his distinguished service in increasing safety in mining and metallurgical occupations. This award met with the general approval of the assembly.

Prof. James F. Kemp, of Columbia University, and E. P. Mathewson, two gold medallists of the society, were called on for addresses. Prof. Kemp briefly reviewed the changing views as to what is the chief ore of copper, chalcocite having come to occupy the pre-eminent position formerly conceded to chalcopyrite. Mr. Mathewson's remarks were entertaining and in his usual vein.

The master of ceremonies then introduced J. E. Spurr, his newly elected successor as president. Mr. Spurr modestly acknowledged his appreciation of the action of the members in selecting him for this honor, and went on to outline his hopes for the society during 1921.

Underground Moving Pictures Shown at A. I. M. E. Meeting

New York Section Sees Films of Standardized Operations at North Butte Mining Co.'s Properties

The regular monthly meeting of the New York section of the A. I. M. E. was held at the Engineering Societies Building on Jan. 6 with E. P. Mathewson in the chair. The only speaker of the evening was Robert Linton, president of the North Butte Mining Co., who showed the moving pictures of standardized underground operations at his company's properties. It was these pictures that attracted such favorable comment when shown at Minneapolis during the Lake Superior meeting of the Institute.

In his introductory remarks Mr. Linton gave as the cause of the lack of smooth operations in many enterprises the fact that operating units have increased so in size that there is not close enough contact between the management and the men. This also results in loss of identity by the workman and in time causes loss of initiative, all of which has a marked effect on a man's work. Referring to his early coal-mining experience in Pennsylvania Mr. Linton said the mines he had to do with were small but they produced skilled men. Today, on the other hand, there is a dearth of skilled miners, especially since the beginning of the war.

It was in recognition of these facts, said Mr. Linton, that the North Butte company undertook to increase the efficiency of its miners. Time studies were undertaken and various standards of work established. The next step was to put these standards into effect, starting first with the shift bosses, who were accustomed to meet once a week. It was at these meetings that photographs were first employed. For instance, bad spots noted underground by the safety engineer were photographed and the effect of these photos when thrown on a screen for all present to see was marked. This work was so successful that it was extended for the benefit of the rank and file. Moving pictures were taken of standardized underground operations as performed by skilled workmen. These, said Mr. Linton, are displayed twice a week.

MEN YOU SHOULD KNOW ABOUT

Matthew Van Siclen, mining engineer, of the Bureau of Mines, was in New York City recently.

C. P. Ross, who has been investigating oil geology in South America, has resumed his work with the Geological Survey.

Carl J. Calvin, assistant chief engineer of the Arthur Iron Mining Co., has left for Los Angeles, Cal., on a month's visit.

Charles L. Burdick, mining engineer, of the Chile Exploration Co., sailed from New York City on the "Santa Luisa," on Dec. 29.

George W. Stose, geologist, of the Geological Survey, has been elected president of the Geological Society of Washington, D. C.

K. C. Heald, who has been classifying oil lands in Montana and Wyoming for the Geological Survey, has returned to the Washington office.

S. M. Soupcoff, mining engineer, with the Garfield Smelting Co., Salt Lake City, Utah, was in New York City on professional business on Jan. 7.

James T. Kemp, with the International Nickel Co., Port Colborne, Ont., was in New York City over the holidays. He has returned to Port Colborne.

N. H. Darton, who has been doing geological work for private interests in Mexico for the last nine months, has resumed his duties for the Geological Survey.

T. C. Hopkins, of Syracuse University, is in Washington to undertake some special work for the Geological Survey's section of Foreign Mineral Reserves.

Henry C. Perkins, mining engineer, of Washington, D. C., has been appointed a member of the advisory board of the Super-power Survey. Mr. Perkins is a member of A. I. M. E.

Dr. C. D. Walcott, former director of the Geological Survey and vice chairman of National Research Council, will succeed the late Dr. Bumstead, at least temporarily, as active chairman of the council.

J. M. Callow, mining engineer of Salt Lake City, Utah, and president of the General Engineering Co., has been in Superior, Ariz., on professional affairs. He is expected to return to Salt Lake City by Jan. 18.

A. C. Oliphant is acting assistant secretary in charge of the Washington, D. C., office of American Engineering Council. His address is care of McLachlen Building, 10th and G Streets, N. W.

Glenville A. Collins, mining engineer of Seattle, Wash., has taken over the management of the Drum Lummon Mines, Ltd., replacing W. Porteous Sloan. The property is situated near Hartley Bay, Douglas Channel, B. C.

Charles F. Thompson, recently connected with the metallurgical department at the Burro Mountain branch of Phelps Dodge Corporation, is reported leaving that service to go into the mining and milling department of the Mine & Smelter Supply Co.

E. L. Jörgensen, formerly general superintendent of reduction for the Chile Exploration Co., Chuquicamata, Chile, and for fifteen years with Guggenheim companies, has opened an office as consulting engineer, at Suite 1429, 150 Nassau St., New York City.

CHARLES W. GOODALE

Charles W. Goodale, mining engineer, and chairman of the bureau of safety of the Anaconda Copper Mining Co., Butte, Mont., is the 1921 recipient of the gold medal of the Mining and Metallurgical Society of America.

Herbert S. King has been appointed superintendent of the Chandler Mining Co.'s Chandler mine, at Ely, Minn. Mr. King is one of the directors of the company. The former incumbent, Capt. Frank A. Kent, resigned, and has gone to San Fernando, Cal., to spend the winter.

George E. Farish, consulting mining engineer, has resigned as managing director of those Central American properties to which he has exclusively devoted his time for the past two years. Mr. Farish is resuming his general consulting practice at 25 Broad St., New York City.

Walter R. Crane, mining engineer, who has been chief engineer for the War Minerals Relief Commission during the past year, has now taken up his duties as superintendent of the Tuscaloosa, Ala., experiment station of the Bureau of Mines. His headquarters are at Birmingham, Ala.

George C. Mackenzie has been appointed secretary of the Canadian Institute of Mining and Metallurgy, and has assumed his duties at the institute's headquarters in Montreal. Mr. Mackenzie was recently president of Electric Steel & Metals Co., Welland, Ont., and formerly served at Ottawa as secretary of Munitions Resources Commission.

Dr. Henry M. Ami, F.R.G.S., for many years connected with the Canadian Geological Survey, and for the last four years attached to the British Embassy at Washington conducting studies in war metals and minerals, has gone to the south of France for a prolonged rest. He will resume work in connection with the Canadian Geological Survey on his return to Canada.

OBITUARY

A. P. Watt, metallurgist, of New York City, died Dec. 29, 1920, from the effects of an attack of influenza which he contracted a year ago.

Henry Andrews Bumstead, chairman of National Research Council, died on the train while returning to Washington from convocation week at Chicago. As scientific attaché of the United States Embassy at London in 1918, Dr. Bumstead was in immediate charge of the exchange of confidential scientific data with the Allies. He was born in 1870, at Pekin, Ill., and had been professor of physics at Yale, and director of the Sloane Physical Laboratory there since 1906.

Herman Garlichs, metallurgist, of Brooklyn, N. Y., and during the World War an advising metallurgist as a "dollar-a-year man," died on Saturday, Jan. 8, at his home. Mr. Garlichs was born in Brooklyn, May 23, 1859. He was graduated from the Columbia School of Mines in 1880 and soon after went to Colorado, where he became a United States Deputy Mineral Surveyor. As mining expert and metallurgist he was associated from 1884 to 1908 with the Aurora, Omaha and Grant, Velardeña, Kansas City, American and St. Louis smelting companies in the West, and later with the Balbach Smelting Co. in Newark, N. J. He retired from active business a few years ago but retained membership in A. I. M. E. and M. & M. S. A.

Ferdinand Schlesinger, of Milwaukee, Wis., one of the directors of the Newport Mining Co., operating the Newport mine, Ironwood, Mich., and owner of other extensive holdings on the Marquette and Gogebic ranges, died suddenly on Jan. 3, while aboard a train on his way to California. Mr. Schlesinger, many years ago, was connected with the Chapin mine, Iron Mountain. Subsequently he acquired interests in many mines in the Lake Superior district, and had considerable holdings there when he gave up active business a few years ago. At that time other interests joined him in organizing the Steel & Tube Co. of America, taking over the Newport mine, the Anvil-Palms, at Bessemer, Mich., and the Isabella, on the Marquette Range.

THE MINING NEWS

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LEADING EVENTS

Simon Guggenheim Replies to Eilers' Charges

Points Out Development of Company Under Family's Control in Letter to Stockholders

Stockholders of the American Smelting & Refining Co. and of the American Smelters Securities Co. have received from Simon Guggenheim, president of both concerns, a pamphlet containing a denial of charges made against the Guggenheim Brothers in their management of the properties by Karl Eilers, formerly an officer and director of the company. The pamphlet includes a copy of Mr. Eilers' statements. Mr. Guggenheim says:

"I emphatically deny, both on my own behalf and that of my brothers, all charges of improper conduct made by Mr. Eilers in the following pages, and assert that at all times my brothers and myself have sought honestly and faithfully, to the best of our ability, to further the interests and welfare of the American Smelting & Refining Co.

"Our connection with the company's affairs began in 1901, and it is with pardonable pride that we point to the development of the company in the intervening period, as shown by the following comparison:

"That the policy of the present management has been successful is evident from the fact that in the fiscal year of the company ending April 30, 1901, the net earnings of the company were $3,828,000, representing 3.83 per cent of the then outstanding capital stock; during the six and two-thirds years ending Dec. 31, 1911, the average annual net earnings were at the rate of $12,145,000, or at the rate of 8.15 per cent of the then outstanding capital stock; during the three years ending Dec. 31, 1914, the average annual net earnings of the company were at the rate of $12,165,000, or 8.28 per cent of the then outstanding capital stock; during the three years ending Dec. 31, 1917 (these being war years), the average annual net earnings of the company were $21,375,218, or at the rate of 15.19 per cent of the then outstanding capital stock; in the year ending Dec. 31, 1918, the net earnings were $13,887,000, being 11.10 per cent of the then outstanding capital stock; during the year ending Dec. 31, 1919, the net earnings were $11,248,000, being 9.09 per cent of the then outstanding capital stock, the latter year being a reconstruction year following the signing of the armistice, during which industrial and commercial conditions were generally unsettled. (All figures for net earnings are without allowing charges for depreciation, as the company's records, prior to 1911, were kept on that basis.)

"While my brothers, because of advancing years, have been compelled to restrict somewhat their business activities, so long as any of us are connected with the company, we shall continue, as in the past, to work faithfully and unselfishly for the company's best interests, and to exercise our best business judgment in the management of its affairs.

"It is regrettable that a sensational and wholly unnecessary suit should have been brought in a period of drastic readjustment of all security values, inevitably causing a needlessly severe and unjustifiable fall in the market price of the stock of the company."

A call for proxies for the next meeting has been sent out by Mr. Eilers.

WEEKLY RÉSUMÉ

Wage decrease and curtailment of output continue the most prominent features of the industrial situation. Following its recent act in cutting salaries below $5,000 the American Smelting & Refining Co. has announced a general reduction in pay of all day workers. Wages have also been reduced by mining companies in the Cobalt district and by the New Jersey Zinc Co. A cut of 10 per cent has been put in effect by independent operators on the Cuyuna Range. At Duluth the Zenith Furnace Co. has blown out its furnaces. In Washington the American Mineral Production Co., a magnesite producer, has shut down, owing to the importation of the Austrian product. In Mexico the Cananea Consolidated has closed down two mines. In Arizona a number of branch railroads have been adversely affected by the decreased tonnage available. Of interest is the fact that Anaconda has turned out its first bar of aluminum at the Washoe Reduction Works, though this is in the nature of an experiment. After refusing to allow a decrease in freight rates on Coeur d'Alene ores shipped to East Helena and Northport the Interstate Commerce Commission reversed itself and granted permission. Stockholders of the A. S. & R. have been sent a pamphlet by Simon Guggenheim in which the development of the company under Guggenheim control is emphasized, in an effort to refute Karl Eilers' charges.

Flin Flon Option Expires Before Spring

Principals Must Decide If It Is To Be Taken Up or Dropped—Construction of Road Up to Purchasers

Engineers for the Flin Flon syndicate are now on the property in northern Manitoba for the purpose of making the final decision as to whether the option held by Colonel Thompson and associates should be taken up or dropped.

The matter of a railroad has been put up to the purchasers by the Manitoba government. The latter will build the railway if the former will guarantee certain expenditures and construction of a smelter. The Dominion government will also operate the road under a favorable lease.

American Smelting Cuts Wages After Salary Decrease

Perth Amboy Refinery Down—Tacoma and Baltimore Plants Curtailed

A cut in wages of about 15 per cent has been announced by the American Smelting & Refining Co., effective at its various smelters and refineries. This follows closely upon the flat 15 per cent cut in salaries for officers and office workers getting less than $5,000 per year. No reduction has been made in the salaries of those getting $5,000 or more per year for the reason that none of these received an increase.

The Perth Amboy copper refinery has been shut down for six months. The Tacoma refinery is running at 75 per cent capacity and the Baltimore plant at 60 per cent. The Garfield smelter is sending some of its output to Tacoma to get the benefit of the ocean freight east.

Comstock Miners Agree on Six Months' Wage Scale

Miners of the Gold Hill section of the Comstock lode at Virginia City, Nev., are now working under a six months' wage-scale agreement, providing for a minimum wage of $5.50 and ranging up to $6.50 for mechanics. The agreement was reached at a meeting called by Governor Boyle at his office at Carson City and attended by heads of the miners' union and by Bulkeley Wells, president of the United Comstock Mines Co. Several hundred men are affected by the wage agreement.

Anaconda Turns Out First Bar of Aluminum

Made at Washoe Reduction Works—Achievement Said To Be in Nature of Experiment

A feature of the past week in mining and smelter circles at Butte, Mont., was the production at the Washoe Reduction Works of the Anaconda Copper Mining Co. of the first bar of aluminum made by the company, marking a metallurgical achievement which is confidently looked forward to as having many possibilities in the direction of the copper corporation's probable entry into the field of aluminum production.

While the initial output of metallic aluminum by the Anaconda can hardly be said to be other than in the nature of an experiment and does not represent anything as yet on a commercial scale, still the research work in this line of endeavor has attained such results that the engineers of Anaconda express confidence in their ability to secure the necessary economies in the reduction of the metal. When this is achieved the prediction is made in interested circles that Anaconda will revolutionize the aluminum industry, much in the manner that it did the treatment of refractory and complex zinc ore by the introduction of the electrolytic process, as employed in its plant at Great Falls, Mont.

Anaconda officials have hitherto been hesitant to speak of the company's interest in the possibilities of aluminum in view of the very heavy electrical expense attendant upon the treatment of bauxite, which is the common ore of the metal.

R. W. Howell Shot From Ambush in Northern India

Details of the death of Ralph W. Howell, an American geologist, who was killed while doing oil work in northern India, just have reached this country. Mr. Howell and his interpreter were riding 200 yards in advance of other members of the geological party when shots from ambush killed both Mr. Howell and the interpreter. The military escort, which had been furnished by the British Government for the party, would have joined the geologists within less than an hour. In fact, the geological party was just eight miles away from the point where it was to have met its escort.

Wages Cut at Cobalt

The mining companies of Cobalt, Ont., have announced a cut of 75c. per day in wages for all classes of labor. This will be effective Feb. 15.

New Jersey Zinc Cuts Wages

The New Jersey Zinc Co. at Palmerton announced Jan. 8 a 10 per cent cut in wages and the elimination of an 8 per cent bonus system, effective Jan. 15. The plant will return to full operation.

Freight Rates Reduced on Cœur d'Alene Ore

Shipments to East Helena and Northport Smelters Affected—Rates Same to Both Points

The reduction in freight rates on ore from points in the Cœur d'Alene district, Idaho, to East Helena, Mont., and Northport, Wash., effective Jan. 1 and Feb. 1, respectively, which were finally approved by the Interstate Commerce Commission, will prove of tremendous benefit; in fact, without it some of the mines would probably have to close down. The rates to both points are the same. Shipments to the East Helena include those from the Morning, Bunker Hill, Hunter and numerous leasing companies. Shipments to Northport are confined to the Hercules and the Tamarack mines. According to the new tariff, ore valued at not over $30 has a rate of $3 per ton. For each increase of $10 per ton 25c. per ton is added up to $100, and ore valued at over $100 will pay $5 per ton. A comparison of these rates with the old schedule makes the advantage strikingly apparent. Under the old tariff $60 per ton was the minimum valuation and the rate on that class was $4.25 per ton. On ore valued at not over $65 the rate was $6.50 per ton, and on ore valued at not over $100 the rate was $9.37½ per ton.

New Wage Schedule Adopted by New Mexico Companies

The following wage scale, effective from Jan. 1, has been adopted in the Lordsburg district in New Mexico and, it is expected, will also be adopted by companies operating vein mines elsewhere in the state:

Machinemen Drifters	$4.25
Machinemen Stopers	3.50
Timbermen	3.80
Muckers	3.00
Nippers	3.40
Miner Helpers	3.50
Trammers	3.00
Skip Tenders	4.00
Skip Tender Helpers	3.50 & 3.00
Motormen	3.50
Motormen Helpers	3.00
Ore Sorters	2.75
Ore Loaders	3.00
Trackmen	3.80
Trackmen Helpers	3.25
Pipemen	3.80
Pumpmen	3.75
Hoisting Engineer	4.80
Carpenters	5.30
Carpenter Helpers	3.75
Blacksmith	5.30
Blacksmith Helpers	3.75
Drill Sharpeners	4.60
Drill Sharpener Helpers	3.75
Watchmen	3.80
Drill Repairmen	4.80
Machinists	5.30
Machinist Helpers	3.25
Labor-Surface	2.75
Engineers, Power Plant	5.30
Hoisting Engineers, Dinky	3.50
Firemen	4.50

Wages Reduced by Cœur d'Alene Mining Companies

Muckers To Receive 25c. Less Than Miners—Bunker Hill & Sullivan Issues Statement

Effective Jan. 1, mining companies of the Cœur d'Alene district, Idaho, reduced wages of all employees $1 to $1.25 per day. The cut of $1.25 applies only to muckers, who have been receiving the same pay as miners and who will now receive 25c. less per day. This applies to all mining companies of the district except the Bunker Hill & Sullivan, where a difference in pay of miners and muckers has always prevailed. Wages in this district are fixed under a sliding scale adopted Feb. 1, 1916, which adds 25c. per day for each half cent increase in the price of lead above 5c. per lb. The maximum increase provided in the scale is $1.25 per day, with $3.50 per day as a base. However, during the war when the price of lead was soaring around 10c. and the cost of living was keeping pace with it, Cœur d'Alene operators continued to advance the rate of pay above the requirements of the sliding scale until $5.75 per day became the underground pay. This rate was maintained until the reduction just made. Under the sliding scale, when lead is under 5c. per lb. no bonus is required, but in spite of this provision the rate is now equivalent to a bonus of $1.25 per day, miners receiving $4.75 per day and muckers $4.50, corresponding to 6½c. lead.

The following notice was posted at Kellogg at the Bunker Hill & Sullivan Mining Co.'s mines:

"Notice to all employees: The price of lead has fallen from 9c. per lb. September last to a present price of 4¾ and 4½c. per lb. This is the lowest lead price in over five years and no longer makes possible the further payment of the present bonus of $2.25 per shift. The bonus additions, 50c. each, announced July 20, 1919, and Feb. 16, 1920, are withdrawn. Beginning with the 7 a.m. shift Jan. 1, 1921, the bonus paid all employees will be reduced $1, and the payment of a bonus of $1.25 continued."

The wages paid under the above schedule will be $4.75 for miners and muckers $4.50. It is believed that the employees will accept the reduction without any complaint, as they have been expecting a reduction.

The general manager, Stanly A. Easton, gave out the following statement:

"The bonus to employees was instituted by the local mining company Feb. 1, 1916, and the sliding scale then published was as follows: Hereafter when lead is 5c. a lb. or higher a profit-sharing bonus will be paid in addition to the minimum scale of wages as follows:

"Twenty-five cents per shift when lead is 5c. a lb. and under 5½c.

"Fifty cents per shift when lead is 5½c. and under 6c. a lb.

"Seventy-five cents per shift when lead is 6c. a lb. and under 6½c.

"One dollar per shift when lead is 6½c. a lb. and under 7½c.

"When the average price of lead in New York is less than 5c. no bonus will be paid and the regular scale applies.

"The advances in the bonus as indicated by the above scale were regularly made, but because of living and other conditions the maximum bonus of $1 per shift indicated has been more than doubled. The bonus for the larger part of 1920 has been $2.25 per shift, which the metal market has made it necessary to reduce, although the bonus still remaining far exceeds the amount indicated by the Feb. 1, 1916, announcement, the literal application of which would result in no bonus at all being paid.

"It is planned that local operations will continue at their present full scale and that there will be no curtailment or layoff of men or cutting down of improvement or construction jobs."

Northwestern Lead Co. Has Been Agent for Bunker Hill Lead

The Northwestern Lead Co., of Seattle, in which, according to a recent announcement, the Bunker Hill & Sullivan Mining & Concentrating Co. has taken over a substantial interest, is engaged in the manufacture of lead pipe, sheet lead, lead traps, bends and other supplies for the plumbing trade. This company has been the selling agent for "Bunker Hill" pig lead in Washington, Oregon, Idaho, Montana, Wyoming and Alaska, and under the new arrangements the company will extend its field for Bunker Hill lead to California and all other Western states.

Recent Production Reports

New Cornelia produced 2,688,456 lb. copper in December compared with 2,670,000 in November.

Calumet & Arizona's December output was 3,000,000 lb. against 3,236,000 in November.

North Butte's production in December was 485,686 lb. copper (1,342,029 in November), 14,540 oz. silver and 29 oz. gold.

Utah Copper produced 7,500,000 lb. of copper in December compared with 9,120,000 in November.

Chino Copper produced 2,999,000 lb. copper in December as against 4,000,000 in November.

Ray Consolidated's December output of copper was 2,975,000 lb. as compared with 3,975,000 in November.

Nevada Consolidated produced 3,000,000 lb. copper in December compared with 3,950,000 in November.

Miami Copper produced 4,373,123 lb. copper in December against 4,505,232 in November.

Greene-Cananea produced 3,700,000 lb. copper and 164,000 oz. silver in December compared with 3,500,000 lb. copper and 159,100 oz. silver in November.

Burma Corporation produced 2,906 gross tons of lead in November from 6,688 tons of lead-bearing material. Refined lead production was 2,203 tons. Refined silver production was 278,750 oz.

Cerro de Pasco produced 4,258,000 lb. copper in December.

Backus y Johnston produced 1,604,000 lb. copper in December.

The output of gold on the Rand in South Africa in December totaled 632,000 five ounces, as compared with 633,000 five ounces in November.

East Butte produced 1,538,760 lb. copper in December compared with 1,658,860 in November.

Anaconda produced 10,500,000 lb. copper in December compared with 11,100,000 in November.

Shattuck Arizona's December output was: Copper, none; lead, 746,750 lb.; silver, 37,621 oz., and 452 oz. gold.

United Verde Extension produced 3,204,258 lb. copper in December.

U. M. du Haut Katanga (Belgian Congo) produced 3,174,624 lb. copper in November.

Inspiration produced 5,000,000 lb. copper in December.

Oriental Consolidated (Korea) obtained $104,650 from its December clean-up.

Phelps Dodge produced 8,318,000 lb. copper in December, as follows: Copper Queen Branch, 4,418,000; Moctezuma Copper, 2,468,000; Burro Mountain, 1,060,000, and custom ores, 372,000.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

House Committee To Consider Revision of Mining Laws

Proposal to Change Assessment Work Year Favored—Views as to Best Time Conflict

Revision of the mining laws is one of the things which Representative Rhodes, the chairman of the House Committee on Mines and Mining, has in mind for early consideration. It is improbable that any action will be undertaken at this session.

The committee is also considering the advisability of legislation which would allow the assessment-work year to end some time in the summer or autumn. At present the assessment-work year is on a calendar year basis. For various reasons it frequently is desirable to do work of this character near the end of the period. With the assessment-work year ending on Dec. 31 there are at least two months prior to the expiration of the period in which little work can be done on mining claims, due to weather conditions.

A bill is now before Congress providing for the ending of the assessment year on June 30. Some object to this on the ground that the snow is not off the mountains in a considerable part of the mining area in time to do the work during the month of June. Some are of the opinion that it would be better to terminate the assessment-work year July 31. Others want it to end Aug. 31, while still others think it would be best to have the assessment-work year end Oct. 31.

No Notice Needed Under Recent Assessment-Work Act

No notice is required by the act of Congress extending the time for performing the 1920 assessment work on mining properties. In former acts, claim holders were required to give notice prior to the end of the year, but the only requirement in the present act is to perform the work prior to July 1, 1921. There is some talk of relieving claim holders of this obligation altogether, but all indications point to the improbability of such action. The text of the assessment-work act follows:

"[S. 4565.] An act extending the time for the doing of annual assessment work on mining claims for the year 1920 to and including July 1, 1921.

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the period within which work may be performed or improvements made for the year 1920, upon mining claims as required under section 2324 of the Revised Statutes of the United States, is hereby extended to and including the first day of July, 1921; so that work done or improvements made upon any mining claim in the United States or Alaska on or before July 1, 1921, shall have the same effect as if the same had been performed within the calendar year of 1920: *Provided*, That this act shall not in any way change or modify the requirements of existing law as to work to be done or improvements made upon mining claims for the year 1921.

"Approved, Dec. 31, 1920."

Chemical Manufacturer Asks Tariff on Cyanide

On Free List in Underwood Act—Claimed Industry Would Have Wrecked Except for War

A duty of 33⅓ per cent ad valorem for cyanide salts has been requested of the House Committee on Ways and Means which is now conducting hearings with regard to tariff information. The request was filed by P. Samuel Rigmey, of the Roessler & Hasslacher Chemical Co., of New York. Mr. Rigmey testified that his company was the first to manufacture cyanide salts in this country and is the only manufacturer producing these salts in commercial quantities. He explained to the committee why sodium is a better carrier for cyanide than is potassium, since it is able to carry a higher per cent of cyanide than potash. He said that the American industry has been much encouraged by the Payne-Aldrich tariff act which allowed a duty of 25 per cent ad valorem on sodium cyanide. The industry received a very serious set-back, he declared, when it was placed on the free list in the Underwood tariff act. The war was all that saved the industry, he intimated. It was stated that during the year ended June 30, 1914, German cyanide to the extent of 8,000,000 lb. was used in the United States. During that year Mr. Rigmey's company sold 13,000,000 lb.

In explaining about the shortage of cyanide in 1916, Mr. Rigmey said that his company had done everything humanly possible, realizing that it was the sole source in this country for the supplies needed by the mining and other industries. A part of his company's plant at Niagara Falls could not be operated for lack of power which went preferentially to the manufacture of munitions. He told of building a new plant at Perth Amboy, N. J. When the plant was ready for operation the power company was unable to comply with its contract and the plant was obliged to shut down. In addition, there was opposition from the government, he declared, as it attempted to build a sodium cyanide plant at Saltville, Va. Several millions were expended, he declared, but the results were nil. He said the plant has now been scrapped.

During the first nine months of 1920, he said, 6,500,000 lb. of cyanide was imported. This came partly from Germany and partly from Canada. He pointed to that as an indication that foreign competition is being revived. He attached special importance to Canadian competition.

Government's Silver Purchases

Silver purchases under the Pittman Act totalled 31,054,361 fine ounces at the close of business Jan. 8.

Bain's Appointment as Director Likely To Be Confirmed

Confirmation of H. Foster Bain as director of the Bureau of Mines is assured. Positive statements to that effect have been made by influential Republican Senators. Due to the imminence of the change in administration, practically none of the President's nominations is being confirmed by the Senate. Those nominations classed as political, will remain unconfirmed, but appointments to the directorship of most of the technical bureaus are not regarded as being political ones. Although even these appointments will probably go over for confirmation at the extra session, there is every probability that Mr. Bain's nomination will be confirmed by the Senate at that time. Mr. Bain has entered upon his duties.

Two War Mineral Relief Awards Recommended

An award of $24,834.53 has been recommended by the War Minerals Relief Commission to cover the claim of the Pocahontas Manganese Corporation. The company's claim was for $50,542.69. In addition, the Commission reconsidered the claim of Arentz & Perkins, which previously had been disallowed. An award of $452.12 was recommended. This is 16 per cent of the amount claimed.

NEWS BY MINING DISTRICTS

Special London Letter

Capital Still Hard To Get—Doubt Silver Demand for Coinage Purposes—Broken Hill Mines Also Handicapped

BY W. A. DOMAN

London, Dec. 27—Markets wound up the last week in a far from Christmassy mood. There are so many claims upon the restricted amount of credit that the banks are able to give, that the numerous mining companies in need of additional capital seem temporarily at least to be faring rather badly. Gold, silver, copper, lead, and tin undertakings are all in the same predicament. They have something to offer in the way of property and ore in reserve, but partly on account of the fluctuating prices of the metals, possible lenders are shy. Santa Gertrudis notes are still quoted at a heavy discount despite the prospects of the company. Silver plays a not unimportant part here and in consequence of the relapse in the metal it is said that the management has under consideration a rearrangement of program. It had been argued that in consequence of the reduction in the output of gold all European countries would compete for silver for coinage. Doubt now exists as to whether this demand will materialize, as nickel is becoming the fashion in greater or less degree as token currency. Santa Gertrudis apparently will concentrate operations upon the gold areas under its control.

The Broken Hill mines are no better off. The Sulphide Corporation after so many months of idleness owing to the miners' strike is resuming in a small way, but some of the mining companies are still further retarded as a result of the cessation of work by the Broken Hill Associated Smelters during the holidays and a week or so longer. While in a sense the long strike at the Barrier Range may have benefited the metal position by enabling stocks to be worked off, it has caused considerable harm to the mines and also to the Commonwealth. Silver, lead, and spelter are quoted at relatively low prices, though it is noticeable that the managements of the companies take quite a cheerful view of the future. There is no steam left in Esperanza; interest vanished when assays fell from the abnormal to something approaching average. A few pennyweight of gold and the "teens" in ounces of silver are all that have been reported for some weeks.

The Rhodesia Broken Hill, a lead-zinc proposition, is also feeling the effect of the fall in the price of lead. From about 15/- the shares have declined to about 7/—. In this property, which covers about 30 square miles, as a concession, over 100,000 tons of actual metal is already proved, so that it has great potentialities when prices right themselves. Experiments are being made in connection with the zinc ore and it is thought that laboratory tests will be equally successful when bulk treatment is undertaken. The company had sold its output well ahead so that it has not suffered so greatly as some other mines.

Further Rand gold mining companies have declared their dividend for the current half year. They are satisfactory in every way. The public, however, recognises that they are in the main the result of the gold premium, and doubts as to how long this will remain high, and as to when working costs will be reduced, and whether the reduction will compensate for the loss of premium, still cause hesitation. Prices were rather better when the market closed on Thursday for the holiday, but the movement was of only a half-hearted character.

CANADA

British Columbia

Production Statistics of Last Year Furnish Surprise—Mining in Eastern Section Reviewed

Victoria—Semi-official estimates of the mineral production of British Columbia for the year 1920, based on reliable figures, furnish a surprise. The unexpected results of the year's work are to be found in connection with the output of silver and copper. Silver, it appears likely, will show a slight increase over 1919, the improvement amounting to about 1,800 oz. The explanation, of course, lies in the activities of the northern mines, chiefly the Dolly Varden at Alice Arm, although it was not thought possible that the blight with which the Slocan silver mining camps were afflicted through labor troubles would be overcome. There was approximately 300,000 lb. more copper produced in the province than in the previous year. Lead will show a decline of nearly 8,000,000 lb. but zinc is put down for an advance of over 20,000,000 lb. All things considered, therefore, the last year has been very creditable to the mining industry of British Columbia.

Vancouver—The necessity of encouraging the production of gold in British Columbia is becoming increasingly apparent and the latest public body to take action is the Mining Bureau of the Vancouver Board of Trade which recently passed a resolution offering a number of suggestions to the Dominion and Provincial Governments. One is the removal of all taxation on gold mines until "such time as conditions return to normal"; another "the return to Canada of all gold produced from exported ores and the purchase thereof by the Mint at Ottawa and the Dominion Assay Office at Vancouver"; and a third "that all gold sold by the beforementioned institutions for industrial purposes should be so priced as to cover the normal cost of production, any surplus revenue to be distributed among the gold mining companies in proportion to production."

Nelson—The year just closed has been marked by considerably decreased mining activity in the Boundary and East and West Kootenay districts of southern British Columbia. Labor shortage and high cost of supplies have been factors partly to blame for an unfavorable season, while during the latter part of the year, prevailing low prices of metals, particularly of silver, lead and copper, with absolutely no market for zinc, have had a retarding effect.

With elimination of Granby's plant at Grand Forks and the Canada Copper Corporation's smelter at Greenwood, practically all of the ore smelted in Kootenay and the Boundary has been taken care of by the Consolidated plant at Trail. Some Slocan output found a market on the United States side, notably high-grade tonnage from Silversmith, Utica and Whitewater, but the aggregate of this is small as compared with the total handled at Trail, the quantity given domestic treatment amounting to 363,687 tons crude and 7,588 tons concentrates, contributed by over 100 widely scattered properties.

The total valuation of mineral output of the Kootenay and Boundary for 1920 is estimated at $8,896,200, of which $8,161,200 received domestic smelting, the balance, $735,000, representing the estimated value of metals in exported ore.

Of metal mine production, the mines of Consolidated M. & S. Co., contributed the great bulk in point of tonnage. Rossland and Sullivan mines of this company are credited with a joint production of 335,797 tons; Nelson and Arrow Lakes with 993 tons of crude and 398 tons of concentrates; Slocan, 6,107 tons crude and 4,533 tons concentrates; Boundary and Similkameen with 10,556 tons crude and 594 tons concentrates.

Considering the many discouraging factors that have prevailed, the year's result, on the whole, may be regarded as satisfactory. Immediate indications are not favorable to a larger output for 1921. With the first of the year wage reductions have become effective in many parts of the country but while this may make it easier from an operating standpoint, a number of other unfavorable factors may retard production and new developments for some months to come.

Ontario

Eleven Silver Mines Working in Cobalt District—Plan New Company To Merge Teck-Hughes and Orr

Cobalt — Owing mainly to power shortage only eleven of the nineteen silver mines that were working during the fall are now in operation, employing about 1,200 miners as compared with the normal number of 2,000. The mines now working are the Nipissing, Mining Corporation, O'Brien, Coniagas, La Rose, University, Princess, Kerr Lake, Crown Reserve, Bailey and Ruby of which the Nipissing is the only one that has not considerably curtailed operations. Although the shortage of power has been the determining factor in the decision to close down or limit operations, the low price of silver has had an appreciable influence with mine managers in this direction. The supply of power remains better than was anticipated and is regarded as being assured in sufficient volume to maintain operations at the present rate until late in February, which is, of course, dependent on the weather. At the Beaver and McKinley Darragh, which have closed down, the workings are being kept clear of water so that work can be resumed in the spring without delay.

The high-grade surface veins discovered at the Kerr Lake last summer have proved disappointing at depth. A raise on one of them has been carried within 30 ft. of the surface with no silver content, and the indications are that the surface enrichment of the veins only extends a few feet downward.

Kirkland Lake—The shaft of the Lake Shore has reached the 600-ft. level, and sinking has been discontinued until a level has been established and a crosscut run to No. 2 vein under Kirkland Lake. When this work is completed the shaft will be put down to the 800-ft. level.

The King-Kirkland has ordered a mining plant, and as soon as it is installed development work will be begun on a substantial outcropping ore shoot.

A shipment of gold bullion valued approximately at $30,000 produced during December has been made from the Kirkland Lake mine.

The plan under consideration for the merger of the Teck-Hughes and Orr mines involves the organization of a new company, capitalized at $5,000,000, with shares of the par value of $1, of which 2,500,000 shares will be distributed among the Teck-Hughes interests including the bondholders, 1,500,000 shares going to the Orr shareholders, and 1,000,000 remaining in the treasury.

Porcupine—Diamond drilling on the sand plains southwest of Timmins through an overburden of 400 to 500 ft. of sand and gravel, which is being financed by English capital, has been suspended during the cold weather. Some of the drill holes have been put down to a depth of 700 ft. and veins carrying gold content are stated to have been encountered.

Elk Lake—At the Regent a shaft has been put down 35 ft. on a vein containing silver content including wall rock over a width of from 2 to 3 ft. A car of ore will shortly be shipped to Cobalt.

AUSTRALIA

New Mount Quamby Company Formed To Work Gold Property in Cloncurry Field—Cobalt and Mica Also in Same District

By Our Special Correspondent

Brisbane, Nov. 28—The vast mineral belt embraced in the Cloncurry field in Queensland, 600 miles inland by rail from the northern port of Townsville, has for years been regarded as a copper area only, but indications of late point to its becoming something more, and, in view of the fact that copper is just now down to a price at which it can barely be produced with profit, satisfactory developments with regard to other minerals will be welcomed. A company has lately been floated, with a capital of £100,000, known as the Mount Quamby Gold Mining Co., to work a property in this district which, it seems, has long been known as gold-bearing. It is a large conglomerate deposit that was worked for alluvial gold for some years prior to the war by two brothers, who on the outbreak of hostilities went to the front. On their return the mine was tested with the aid of capitalists from the south and the company was formed. The sampling already done, extending over a length of 600 ft. from north to south and 100 ft. from east to west, has given assay returns ranging from

6 dwt. to 6 oz. 4 dwt. per ton, the average being 1 oz. 12 dwt. This result is considered so satisfactory that six new leases, each covering an area of 25 acres, have been taken up.

Cobalt has also been discovered in the Cloncurry district, twenty miles south of Selwyn, the headquarters of the Mount Elliot company. The property is being tested by two prospecting shafts sunk to a depth of over 50 ft. on the ore channel, exposing an orebody varying from 2.12 ft. to 5 ft. in width and extending a length of 300 ft. The last report to hand showed that both shafts were in ore averaging about 5 per cent metallic cobalt. On the surface this occurs as cobalt bloom (erythrite) and lower down as cobaltite. The prospects are promising, and it is intended to take the prospecting shafts to a depth of 100 ft.

Good finds of mica have likewise been made in the Cloncurry field, as well as in the Chillagoe and Etheridge districts further north, but nothing has been done to develop them.

the 150-ft. level, according to the report of the consulting engineer, Frank W. Royer. The main orebody has been opened for a length of 240 ft. and is from 8 to 30 ft. wide. Three levels have been driven above the 150 and a 50-ft. winze from the latter is in ore assaying 35.6 oz. silver. The main orebody is estimated at 50,000 tons and work on another vein has exposed 3,800 tons sampling 24.7 oz. silver. A mill will be provided this year.

Chihuahua

Potosí Company Cuts Forces—Buena Tierra Doing Extensive Exploration Work—Manta Making High-Grade Shipments

Santa Eulalia—The general tendency in this district indicates conservative curtailment. Several of the larger operating companies have materially reduced their forces and work on the lower grade deposits is being temporarily stopped. A number of the companies have also made reductions in their scale of wages. The chief cause for retrenchment is obviously due to the declining market quotations. To add to this condition the Mexican coal miners' strike has seriously threatened the coal supply of at least one company. Nearly all of the various mine officials are moving into the camps now with their families. It is the first time in several years that conditions have been considered stable enough to warrant such a move.

The Potosí Mining Co. has recently reduced its forces by releasing about 200 men. A small reduction has also been made in wages. This company has lately installed a large Worthington pump at the company wells at Hacienda Robinson. Water is pumped from these wells to supply the mines at Santo Domingo. Not long since a large Snow boiler was added to the power plant of this company. For several months past a large crew of men has been engaged in straightening curves and regrading the tracks of the narrow-gage railroad of the Potosí company, running between Santo Domingo and Hacienda Robinson, preparatory to putting into service the new locomotives bought some time ago.

The properties of the American Smelting & Refining Co. are operating on a more conservative scale. All work on the San Antonio and the Dolores mines has been discontinued, and forces of the Velardeña and the Sin Nombre mines have been materially reduced. The Mina Vieja mine alone is proceeding without any pronounced curtailment of forces. In all, about 400 men have been released from the various mines of this company. Construction work is well under way on the new home for the superintendent. W. J. Deavitt, superintendent of the Santa Eulalia Unit, recently returned from a trip to various eastern points in the United States. W. M. Benham has been transferred from Sierra Mojada, Coahuila, as engineer for the A. S. & R. Santa Eulalia Unit.

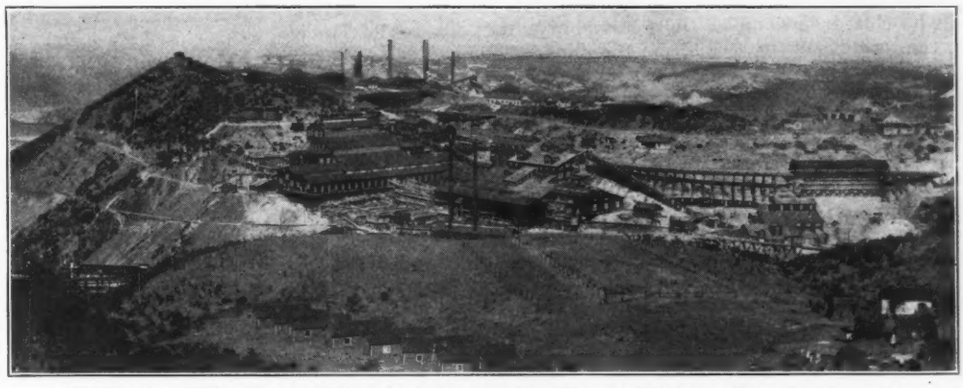
The Buena Tierra Mining Co., Ltd., is carrying on extensive exploration work at present. Besides the crosscutting under headway on the various levels this company is also engaged in sinking both of their main shafts. Diamond drill work has been discontinued for the present. A machine shop is now under construction and a complete equipment of tools and machines has been purchased. The headquarters and offices of the company have been moved from Chihuahua to the property at Santo Domingo.

The Cia. Minerales y Metales has temporarily suspended operations because of the coal shortage on all of the properties it was operating in this district, with the exception of Inglaterra and Cosineras group. It is reported that two ore caves have lately been encountered on the Inglaterra property. John M. Brooks is superintendent of the Santa Eulalia Unit.

The Reina de Plata mine is continuing exploration work, and is making small shipments of ore regularly. Lindsay Brown is superintendent.

El Cristo mine is being operated under the direction of George M. Hillary. Regular shipments of ore are being made to the railroad at Santa Eulalia by burro train.

The Manta Mining Co., of which W. J. Deavitt is superintendent, is shipping four to five cars of high-grade silver ore monthly. The ore is carried



GENERAL VIEW OF CONCENTRATOR OF CANANEA CONSOLIDATED COPPER CO., LA CANANEA, SONORA, MEXICO

MEXICO

Sonora

Calumet & Sonora's New Power Plant Almost Finished—Cananea Consolidated Closes Two Mines

Cananea—The Calumet & Sonora Mining Co. has almost completed its new power plant, which will be put in operation about Jan. 15. Alterations at the mill will be finished as soon as some necessary equipment arrives. Operations at the mine have been of development character only. The shaft has been sunk to the 800 level and will be continued to the 900. The mill should be in operation before the end of the month.

The Cananea Consolidated Copper Co. has closed down the Capote 15 and Cananea-Duluth mines. These mines produce the concentrating ore. The mill will be run until the ore on hand has been cleaned up. The pumps at the Cananea-Duluth will be pulled but those at the Capote will be operated during the close-down.

Arizpe—The Carmen mine, purchased by the Florence Divide Mining Co. of Nevada, has developed over 50,000 tons of 20 to 28-oz. silver sulphide ore above

by burro train to the railroad at Santa Eulalia. Systematic exploration work is going on at the same time; the shaft is being sunk 150 ft. deeper and the program calls for extensive crosscutting.

Johnson and Davidson and associates of Chihuahua have stopped the prospecting they were doing on La Sirena property in the East camp, near the San Antonio mine of the A. S. & R. Co. One or two cars of high-grade zinc ore were shipped.

Oscar Trevino is working the Spartaca mine in the East camp.

CHOSEN

Tabowie Mine Stope Fire Still Burning

Unsan, Dec. 6—The November clean-up of the Oriental Consolidated exceeded expectations, partly because the Tabowie surface dump, on which the mill has been running since Nov. 11, is of better value than estimated and partly because better sorting was done in the Taracol mine than expected. The Tabowie surface dump will last another three or four days after which the Tabowie mill will be closed down until hoisting ore in the mine can be resumed. The Tabowie mine stope fire is still burning; the fire is now between No. 8 and No. 9 level, very close to No. 8 level. There is no more fire below No. 9 level. The management states: "We are still working day and night fighting the fire and perfecting the bulkheads whereby the fire will be isolated east of the ore bearing section of the mine. The gas continues bad. The bulkhead on No. 5 level in the main drift at 1,020 ft. E. took eight days and nights of continuous work with mine rescue apparatus on, as the gas was very thick at this point. The bulkhead was built of concrete and brick and is 9 ft. wide, 9 ft. high and 2 ft. thick. It was an awful struggle to get it completed. No one has been killed or injured so far, for which we are thankful. The 20th, 19th, 18th, 17th and part of the 16th levels are now flooded; we are unable to send water to the surface as all the water is needed for pumping on to the burning area."

ALABAMA

Steel Corporation's Purchase of Brazilian Manganese Properties Interests Birmingham

Birmingham—Purchase of the Morro da Mina manganese property in the state of Minas Geraes, Brazil, by the United States Steel Corporation, announced from New York by Judge Gary recently, is of interest to those in the Birmingham district as ore from that section is now being imported here via Mobile and thence up the Warrior River in barges to the Port of Birmingham, thence by rail to the furnaces at Bessemer, 12 miles from Birmingham. The Tennessee Coal, Iron & Railroad Co., the subsidiary of the Steel Corporation, uses considerable manganese ore. A cargo of 6,500 tons of Brazilian ore has just been brought up the river. The deposits in Brazil are said to be of such proportions as to guarantee the corporation a supply for many years to come, and make it independent as to this ore. The government, in addition to the Warrior River transportation facilities, is now constructing a coal and ore storage plant at Mobile which will provide apparatus for discharging cargoes quickly and loading lighters.

The Alabama Co. has taken an option on the Hammond ore mines, north of Gadsden, in Etowah County. The option is for six months. Indications are that the deal will be consummated. This will give the Alabama Co. a more bountiful supply of ore for a number of years to come. The Hammond mines have been property of J. W. Hammond and C. E. Buek and the ore is of a good quality. The company has two blast furnaces in Gadsden, not so very far from the ore mines.

Y. A. Dyer, who some time back took over the brown ore mines at Cave Springs, Ga., is installing a washing plant and will in the next few weeks be delivering washed ore to a consumer in his vicinity, the ore to be hauled from the mine by motor-truck.

The Woodward is still working on the shaft sunk to its ore veins, not far from Woodward; the Gulf States Steel Co. is getting a little ore from the immense slope at Shannon, the big deep-ore mining project a few miles below Birmingham, and the Republic Iron & Steel Co. is putting in improvements at its brown ore mines near Woodstock. Undeveloped ore fields in the state are being examined and some drilling is being done.

MINNESOTA

Mesabi Range

St. Louis County Tax Report Out—Laure Mine Suspends — Wabigon Shuts Down Temporarily Until Warmer Weather

Hibbing—The taxes on mineral lands, as shown by the figures of the auditor of St. Louis County, Minn., comprise 74.63 per cent of the total taxes collected, which amount to $24,453,002. Of this the mines will shoulder $18,250,364, which tends to show the enormous value of the iron ore of Northern Minnesota.

The percentage of taxes paid by the mining companies has been gaining every year. In 1915 the amount paid was $6,249,005 which was 66.80 per cent of the total taxes in comparison with the 74.63 per cent for 1920. The assessed valuation of mineral lands for 1920 shows a gain of $7,905,631 over 1919 with a total valuation of $273,967,081.

The M. A. Hanna Ore Co. reports a total shipment of 3,606,820 tons in 1920 from its mines in Michigan and Minnesota, those in Michigan shipping 1,646,704 tons and those in Minnesota 1,960,116.

The Laure mine of the Inland Steel Co. received orders to close down indefinitely. The heads of departments were retained but 125 men were released.

Chisholm—The Harold, Leonard No. 3 and the Alexandria mines of the M. A. Hanna Ore Co., are operating with one shift at present. The Alexandria has temporarily stopped all production owing to the work of deepening the shaft. It is anticipated that production can be resumed in the near future in conjunction with the shaft work.

The Shenango Furnace Co. has closed the Shenango mine indefinitely owing to market conditions and to the adequate stock piles of the furnace companies at lower lake ports. The closing order does not effect the Webb or Tioga mines of the same company, which will continue with present crews.

Buhl—Owing to the inability of the No. 300 electrically-driven shovel to handle the frozen overburden of the Wabigon pit with a drag line, the property, which is operated by the M. A. Hanna Ore Co., has temporarily closed until the weather moderates. Although the banks were blasted ahead of the shovel yet the frost penetrated to such a depth that the drag line could not operate economically. The Thorne mine of the same company has temporarily closed until next shipping season.

Three shifts of miners have been placed at the Shiras mine of the Oliver Iron Mining Co. to increase production until the lease terminates which will occur soon, and to accommodate some of the miners of the Alpena mine near Virginia which recently was worked out.

Gilbert—Pickands Mather & Co. report total shipments of 4,702,194 tons for the 1920 season from the various ranges divided as follows: Mesabi Range, 2,357,427; Cuyuna, 113,121; Menominee, 902,238; and Vermillion 200,076.

Cuyuna Range

Cuyuna Producers Cut Wages 10 Per Cent — Zenith Furnaces Down—Feigh Mine To Remain Closed

Crosby—Independent iron ore producers of the Cuyuna have made a general wage cut of 10 per cent effective Jan. 1. It is reported that one independent will make a 20 per cent reduction in wage schedules but will work full time through the winter season. There are now only four properties on the range producing and stockpiling ore, and one or two of these are taking steps to reduce their working force and output. At the Armour No. 2 mine of the Inland Steel Co., the largest on the range, seventy men were laid off New Year's day and it is expected that further reduction in the force may be made. It is planned to put this property on one shift per day with no work on Saturdays, thus cutting a normal 1,000-ton per day production 3,000 tons per week.

The Zenith Furnace Co. of Duluth, independent pig iron producers, blew out their furnace on Jan. 1 for an indefinite period dependent upon change in market demands. This is the first time these furnaces have been idle in

ten years. All ore shipments to the furnaces were stopped in December, and this has caused the closing down of the Bonnie Belle mine of the Marcus Fay interests at Ironton, which had been a small but steady shipper to the Zenith for the past three years following its development in 1918. The management has not announced what action will be taken in the spring. The Sagamore mine at Riverton operated by John A. Savage & Co. is another Cuyuna mine which will be affected by the closing of the Zenith furnace as this property supplied all the manganiferous ore used by the Duluth firm. For its iron ores the Zenith also drew on the Utica Mining Co. of the Mesabi and the Section 30 Mining Co. of the Vermillion Range.

Ironton—M. A. Hanna & Co. have cancelled orders for reopening the Feigh mine this month and it is unlikely that the property will resume mining before spring. Installation of new surface equipment is nearly completed. When again in running order the Feigh will have one of the most modern surface plants on the Cuyuna. Engine house equipment consists of two new Ottumwa electrically operated hoists designed for 600 ft. depth. A 100-hp. motor drives the larger hoist operating two 2½-ton skips in balance, and the cage hoist is 75-hp. A single stage, automatic control electric compressor, of 550-ft. capacity and a 125-kw. Skinner engine generator set for emergency use completes the layout.

MICHIGAN

Marquette Range

Ford Preparing to Unwater Imperial Mine — Isabella Iron Transferred to Steel & Tube Co.

Ishpeming—The Ford interests are preparing to unwater the Imperial mine, located in Baraga County at the extreme western end of the Marquette district. Repairs will be made in the shaft, a new hoisting plant installed, the equipment to handle 1,500 tons of ore daily. Ore will be smelted in the Ford blast furnace near Detroit.

Articles of association for the Michigan Iron, Land & Lumber Co., a two-million-dollar corporation, have been filed with the County Clerk of Houghton County by Henry Ford, Edsel Ford and Clara Ford. The company's capital stock is divided into 20,000 shares of $100 par value each, of which one-half, or $1,000,000, was issued.

Final papers have been signed in the transfer of the property of the Isabella Iron Co., Palmer, Marquette County, to the Steel & Tube Co. of America. The purchasers will add a new hoisting plant and run rock drifts that underground haulage may be installed. Deposits of high-grade ore have been developed, this in a section where very little ore of this grade had previously been found. The Cascade is attracting attention because of this development. It possesses a big tonnage of 40 per cent silicious ores.

Negotiations for the sale of the Negaunee Breitung Hematite mine are under way between the owners and the Jones & Laughlin steel interests. The property is located in Negaunee city and has a good record.

The Beaverboard Granulithic Co. has just completed a plant for the manufacture of grits for roofing purposes, near Morgan Heights, Marquette County, and will secure its rock from a prominent outcrop of greenstone at that place. The concern desires rock of green color for covering felt shingles which it manufactures. Other works of similar kind are now in course of construction on the Ishpeming marble range in Marquette County.

The Pioneer Furnace Co., Marquette, reduced the wages of its employees 15 per cent on Jan. 1.

Menominee Range

Penn Iron Co. Reduces Wages—Work on Ford Plant Stopped

Iron Mountain—All work at the new body plant of the Ford interests at Iron Mountain, has been ordered discontinued, and an order for machinery for this place has been cancelled although the work was well along. A wood contractor who was getting out 5,000,000 ft. of logs for the plant was also notified to stop all shipments. With wood camps established, swamp roads made and with ideal winter weather, this is a decided hardship on the contractor.

Vulcan—The Penn Iron Co. has made a wage reduction of from 10 to 15 per cent and is working its mines only four days a week.

COLORADO

A. V. Smelter Running Four Furnaces —A. V. Shaft Idle Temporarily

Leadville—At present the Arkansas Valley plant of the American Smelting & Refining Co. is operating four blast furnaces, the ore being smelted not coming from Leadville mines alone but from Aspen and other territories. The average number of men employed is about 450, and during the summer months considerable difficulty was experienced in securing a sufficient supply, owing to the general shortage all over the country. Mexican labor has largely displaced other classes at the A. V. plant, and during the last few weeks there has been much less difficulty in securing men, owing to the general conditions of unemployment.

Work of driving a tunnel on the old Lyon's placer was begun early last summer under the management of John Cortellini, the purpose of the exploration work being the search for the continuation of the Lillian ore shoots which, it is expected, will be intercepted by the tunnel, at present into the hill for a distance of 450 ft., which will be continued through to the Empire Gulch side of the hill. Work on the tunnel, which is being driven in a southerly direction, has for the present been stopped and a raise is being driven toward the surface for the purpose of introducing an air way. Another raise was driven previously and there was evidence that a contact was being approached together with indications of ore near by. Small bodies of low-grade zinc ore have also been uncovered since the start of the present operations.

At present the famous A. V. shaft is idle, a temporary closing of the property having been necessitated by the cutting off of contracts for manganese ore of which the A. V. shaft is said to have the best grade of all local properties. Lessees are confident that the shut-down will be of short duration and that their contracts will be renewed within a very short time; 3,000 tons of the camp's best grade manganeses ore was the record of production for the A. V. shaft in 1920.

Alice—The Roosevelt Co. is erecting a wire-rope tramway, about ¾ mile long, between mine and mill. Additional stamps will be installed in the mill, and other equipment, which will double the capacity of the plant.

Naturita — The Standard Chemical Co., the largest producer of carnotite and vanadium ore in southwestern Colorado, has closed its plant, and discharged about 100 men.

UTAH

Holidays Cut Shipments from Park City and Eureka

Park City—Shipments for the week ended Jan. 1 amounted to 1,518 tons of ore and concentrates as compared with 2,328 tons the week preceding, the decrease being due to the holiday intermission. Shippers were: Judge allied companies, namely, the Judge, Daly West, and Park-Utah, 615 tons of ore and concentrates and 40 tons spelter; Ontario, 333 tons; and Silver King Coalition, 530 tons.

Eureka—Shipments from the Tintic district for the week ended Jan. 1 amounted to 116 cars as compared with 172 cars the week preceding, the decrease being due to the holiday intermission. Shippers were: Tintic Standard, 49 cars; Chief Consolidated, 17; Iron King, 12; Eagle & Blue Bell, 10; Dragon, 10; Victoria, 7; Iron Blossom, 5; Gemini, 2; Bullion Beck, 1; Centennial Eureka, 1; Mammoth, 1; Swansea, 1.

MONTANA

Anaconda Suspends Production of Manganese Ore—Butte & Superior's No. 3 Shaft Reaches Rainbow Vein

Butte—Anaconda has suspended the production of manganese ore and shortly will close the ferro-manganese plant at Great Falls, in consequence of the falling off in the demand for ferro-manganese from the eastern steel mills.

Sinking of the No. 3 shaft of the Black Rock mine of the Butte & Superior has reached the Rainbow vein on the dip at a depth just below the 2,300-ft. level, showing a promising mineralization with streaks of silver-zinc ore.

The shaft will be in this vein for some time, it is believed, as the fissure is standing farly straight. The No. 3 will be sunk to the 2,600-ft. level. The Butte & Superior has mapped out a six months' development program, consisting principally of shaft sinking and the crosscutting of the Rainbow vein at depths below the 2,000-ft. level. Development work is being prosecuted easterly on the 1,800-ft. level of the Black Rock into the adjoining Four Johns' claim.

CALIFORNIA

Lease on You Bet Claims Taken Over by S. B. Wood—Grass Valley Did Its Assessment Work Early

You Bet—Sydney B. Wood has announced the taking over of the bond and lease from W. A. Hilliard, W. E. Davis, R. A. Davis and John Hussey on the 1,300 acres making up the You Bet claims. Mr. Wood is brother-in-law of Bainbridge Colby, Secretary of State. The old company had secured three permits from the debris association to mine by the hydraulic process and Wood will seek to secure further concessions from the commission with the idea of developing the property to its fullest extent in the method best adapted for its exploitation.

Grass Valley — Locators of mining claims in Nevada County did not take any chances on the enactment of the bill providing for the extension of time for filing proofs of assessment work until July 1, 1921.

NEVADA

Western Chemical Co. Tries Out New Plant—Conditions Normal at Tonopah and Divide

Tonopah—In the Tonopah district conditions are normal, and no new developments of importance have been reported of late. On account of the complicated geology of this district, with irregular intrusions of later volcanics and consequent faulting in the vicinity of contacts, it is necessary to do considerable development work, usually in the nature of crosscuts and raises, with no more definite idea in view than that of cutting up the ground and prospecting for favorable formation. The formations in which ore occurs are pretty well known and as there are a great many veins in the camp, both large and small, with general east-west strike and dips ranging from flat to vertical, but more usually above 45 degrees, any time favorable formations are encountered they are worth crosscutting north and south. For this reason considerable development work has always been done in the mines of the district. Scarcity of efficient men in the past few years has curtailed this development to a certain extent but conditions have improved and more work is being accomplished.

Ore production of the Tonopah Belmont, Tonopah Extension, West End, Tonopah Mining and Rescue mines for the week ended Jan. 2 was normal. Profitable operations are being carried on by lessees in the Montana Tonopah, Midway, Jim Butler and Halifax properties. West End profits for November were $51,057.39 from 5,278 tons of West End mine ore of an average grade of $21.50 per ton and 455 tons of Jim Butler lease ore.

Divide—In the Tonopah Divide mine the southeast drift on the 800 level has passed out of the ore shoot recently encountered and is now in low-grade material. On the 1,000 level there is no change in conditions, the drift being in low-grade vein material. This drift has reached the projected position of the ore shoot as developed on the 800 level and improvement in values is expected any day. Very good progress is being made on both levels. Production continues at the rate of 50 tons of ore per day, the ore being shipped to the Belmont mill.

A pump is being installed in the Gold Reef shaft and pipe line laid to storage tanks on the hill above the Divide mine. All water for both mining and domestic purposes is at present being hauled from Tonopah, a distance of approximately five miles, so that considerable saving will result.

The Kernick, Brougher, Gold Zone, Dividend, Silver and other smaller Divide properties report regular operations with no important developments up to the present.

Blair Junction—The Western Chemical Co., owning a potash alum property near Blair Junction reports that for the last three weeks its plant has been given a thorough tryout. Minor mechanical defects have been corrected. It has been found necessary to install a larger engine for the tube mill and this has been ordered.

Pioche—Ore shipments from the Pioche district for the period from Dec. 9, 1920, to Jan. 6, 1921, were up to the recent average, totaling 7,302 tons. Shippers were: Prince Con., 3,710 tons; Virginia Louise, 1,905; Bristol, 1,125; Black Metals, 355; Bristol Wade-Godbe Lease, 65; Lee Mathews Lease, 50; Stella, Culverwell Crowe Lease, 35; Pioche Assay Office, 30; and Bristol Rex Mathews Lease, 27.

The Prince Consolidated Mining & Smelting Co. has mailed all its present stockholders notice of their preferential right to subscribe for 200,000 shares of treasury stock of the company at 30c. per share. The receipts from the sale will be used in development work. The principal work will be the resumption of sinking the present working shaft to the 825-ft. level.

NEW MEXICO

Ore Shipments from Lordsburg District

Lordsburg—The total ore shipments from the Lordsburg district for the month of December amounted to 73 carloads, or 3,575 tons, having an approximate value of $70,000. The total shipments for 1920 were 1,108 carloads, or 56,284 tons of an approximate gross value of $1,125,680.

ARIZONA

Shannon Has Small Force at Gleason—Small Producers at Bisbee Cease Shipping

Gleason—The Shannon Copper Co. is employing less than a dozen men at its Gleason mine. Some development work is being done. Other than this the camp is closed tight.

Bisbee—At a recent county taxpayers' meeting Grant H. Dowell, manager of the Copper Queen branch of the Phelps-Dodge Corporation, declared that his company annually paid taxes representing a charge of $300 for every man employed and that the tax represented a charge of $2 on every ton of ore produced. The expenses of Cochise County, mainly paid by the mining companies, has increased from $29,545 in 1915 to $1,216,643 in 1920, while the population gain had been slight if any.

Shipments of ore have been discontinued by the Boras Leasing Co. The shaft is being sunk.

Shipping of ore has been discontinued by all other small producers at Bisbee. These include the Shattuck, Denn, Wolverine & Arizona, Night Hawk, Higgins and the Boras.

Phoenix—Shutting down of operations at Christmas by the Gila Copper Sulphide Co. has deprived the Arizona Eastern R.R. branch of several hundreds of tons of freight daily. Application has therefore been made to the Corporation Commission for permission to abandon service on the nine-mile stretch affected.

The Corporation Commission has refused permission to increase freight charges to the Swansea R.R., which has been deprived of the major part of its income by the closing of the Swansea mines.

The Southern Pacific R.R. from Cochise to Courtland and the Southwestern road to the same point from Douglas have cut their schedules to three times a week on stoppage of the mining operations in the Courtland-Gleason mining district.

Miami — Several thousand dollars damage has been done near Miami by fire at the Live Oak shaft of the Inspiration workings, which destroyed the blacksmith shop, the tool-sharpening department and did other damage.

Prescott—The Jerome-Superior stockholders' row has been taken from Los Angeles to Arizona in a suit filed at Prescott by the plaintiffs, who had failed in the coast city on demurrer that their corporation had entity in Arizona.

Douglas—A further reduction of employment and of production has been announced by L. R. Budrow, manager of the Lucky Tiger Combination Mining Co., operating a silver property south of Douglas in Sonora.

Kingman — Hackberry Combination has installed a new hoist and compressor and will buy machine drills. D. D. Martin is in charge at Hackberry.

THE MARKET REPORT

Daily Prices of Metals

Jan.	Copper, N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
6	12.50@12.75	34.00	38.00@38.50	4.75	4.65@4.75	5.50
7	12.50@12.75	33.75	38.00@38.50	4.75	4.70@4.80	5.45@5.50
8	12.50@12.75	33.75	38.00@38.50	4.75	4.70@4.80	5.40@5.45
10	12.60@12.75	34.25	38.25@38.75	4.75@4.85	4.75	5.45@5.50
11	12.75	34.50	38.75@39.00	4.75@4.85	4.70@4.80	5.50
12	12.75	34.00	38.25@38.50	4.75@5.00	4.75@4.85	5.50

*These prices correspond to the following quotations for copper, "delivered": 12.75 @13, 12.75@13, 12.75@13, 12.85@13, 13, and 13c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Jan.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
6	72¾	73¾	80	208½	213¼	22¾	23½	25¼	26¼
7	73	74	80	210½	215¾	23½	24	25⅜	26⅛
8	....							....	
10	74	74¾	81½	210	215	24	24½	27⅛	27⅜
11	74	74	81	209	213¾	23¾	24¼	26¾	27⅛
12	74	73¾	81	205	210¾	23½	24	26½	27⅛

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Jan.	Sterling Exchange	Silver			Jan.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
6	364	99½	68⅝	42½	10	365½	99½	65⅛	40⅛
7	362½	99½	66¾	41½	11	373	99½	65¼	39½
8	362½	99½	65⅝	40⅞	12	373	99½	66	40

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Metal Markets

New York, Jan. 12, 1921

The better tone which characterized the metal market in the first week of the new year has continued, and prices generally have tended upward. The improvement in the stock market has no doubt had an influence. No buying of consequence has resulted, however, and it is generally agreed that this must await a better demand for manufactured products. Pressure to sell appears to have decreased considerably, and most of the metal for sale now seems to be in hands which are able to carry it. A decrease in money rates helps, of course, in this regard. The advance in foreign exchange has made the export situation brighter.

The speculative demand is generally active, particularly for future delivery, but producers generally are not willing to sell in these quarters, even at premiums. Both the demand and the unwillingness to sell are encouraging factors.

Copper

The chief feature of the copper market for the last week has been a much improved export demand, in which both the Copper Export Association and outside agencies have shared. The increase in the value of sterling and francs has helped sales to England and France, and Germany has also been a buyer of no mean importance. The prices charged have netted producers on this side about the same as has been realized on domestic business.

Sales for domestic consumption continue of very meager proportions, and the big buyers are not in the market. The prices asked by the large producers are about the same as those asked by others, a situation which has not existed for some time. Some sellers are asking 13¼c. delivered, but the price today is generally 13c. for January delivery, with a premium of about ¼c. for each month beyond this. It begins to look as if copper was in for a gradual return to higher prices as long as foreign exchange and the general sentiment in business circles continue to improve.

Lead

The A. S. & R. official price of 4.75c., New York and St. Louis, continues unchanged.

Lead has continued firm, with a widely distributed demand for shipments of one hundred tons and less. Large consumers seem well supplied at current rates of consumption. The speculative demand is active, especially for futures, and 5@5¼c. New York has been realized on such sales. Old customers, however—reputable consumers—have had no difficulty in buying at the prices which we quote. There is little likelihood of the price going much above 5c. under present conditions, for Spanish or German lead would then be imported. The statistical position, however, is excellent, with producers well sold up, dealers pretty well cleaned out, and consumers' stocks low. The battery business seems to be improving a little. The coming installations of automatic telephones in New York will require considerable lead for battery purposes, and the automobile business is expected to improve in the spring.

Some business in second-quarter metal has been done at 4.875@5c.

Zinc

No demand, either speculative or consuming, seems in evidence, and the lethargy of this market continues. Too much zinc is available in Europe to allow any marked advance of the price on this side, and no immediate change is in prospect. The demand for futures is entirely confined to speculative interests.

Tin

The improvement in exchange has had its effect on tin prices, but business in all varieties continues small, and buying is done very carefully. Speculators in tin and sterling exchange seem to be doing what little business there is.

Straits tin for future delivery: Jan. 6th, 38.75@39c.; 7th, 38.50@39c.; 8th, 38.50@39c.; 10th, 39@39.25c.; 11th, 39.50@39.75c.; 12th, 39.25@39.50c.

Arrivals of tin: none.

Silver

During the last week the London market dropped from 42½d. to 39½d. This fall was occasioned by heavy selling for China account, part of these sales being against previous purchases. The Indian bazaars have also been buying, but offerings were too heavy for the price to hold. The market in New York has fluctuated between 65 and 69c., the strength here being due largely to the sharp advance in sterling exchange.

Mexican Dollars—Jan. 6th, 52¼; 7th, 50⅞; 8th, 50; 10th, 50; 11th, 50; 12th, 50⅜.

Gold

Gold in London: Jan. 6th, 112s. 2d.; 7th, 113s. 3d.; 10th, 112s. 6d.; 11th, 108s. 10d.; 12th, 108s. 11d.

Foreign Exchange

Foreign money advanced generally during the last week. The advance in sterling was violent and seemed to have its origin in the selling of dollars in London. The market continues thin, however. Conditions are better in South America. Some foreign countries are reported to be arranging the sale of bonds in this country. It is to be hoped that they meet with success, as such sales would have a direct influence in promoting export trade from this country, and it is on this trade that copper producers and others must look for prosperity. On Tuesday, Jan. 11th, francs were 6.185c.; lire, 3.53c.; and marks, 1.44c. New York funds in Montreal, 14⅜ per cent premium, the decline being due to the advance in sterling here.

Other Metals

Aluminum—List prices of 28.3@28.5c. are purely nominal.

Antimony — Chinese and Japanese brands, 5½c.; market quiet. W.C.C. brand, 6½@6¾c. per lb. Cookson's "C" grade, shipment from England, 9¾c. Chinese needle antimony, lump, nominal at 4½c. per lb. Standard powdered needle antimony[1] (200 mesh), 7@7½c. per lb.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 7c.

Bismuth—$2.40 per lb., 500-lb. lots, and $2.42 per lb., 100-lb. lots.

Cadmium—Nominal, $1.40 per lb.

Cobalt—Metal, $5 per lb.; black oxide, $3.40 per lb.; sulphate, $1.35.

Iridium—Nominal, $325 per oz.

Magnesium — Crude, 99 per cent, $1.35 per lb. f.o.b. Philadelphia.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $70@$80 per troy oz.

Palladium—$75 per oz.

Platinum—Firm at $75 per oz.

Quicksilver—Nominally $45 per 75-lb. flask. San Francisco wires $45@$50. Steady.

[1]**Rhodium**—$200@$225 per troy oz.

Ruthenium—$175@$200 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—Wire, $35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 55@60c. per unit, New York. Practically no change on California chrome ore since August; 40@50 per cent can be bought at 50@60c. per unit, f.o.b. cars, California. One party has offered 800 tons of 40@45 per cent at 55c., and has been able to dispose of only 150 tons.

[1]**Manganese Ore**—40@45c. per unit, seaport; chemical ore (MnO_2) $60@$65 per gross ton, lump; $75@$80 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 55@60c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 40c. per lb. in ton lots.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 12c. per lb. for ore, with concessions on large lots or contracts.

[1]**Tungsten Ore**—Scheelite or wolframite, 60 per cent WO_3 and over, per unit of WO_3, $3.25@$3.50, New York.

Uranium Ore (Carnotite)—Ore containing 1½ per cent U_3O_8 and 5 per cent V_2O_5 sells for $1.50 per lb. of U_3O_8 and 75c. per lb. of V_2O_5; ore containing 2 per cent U_3O_8 and 5 per cent V_2O_5 sells for $2.25 and 75c. per lb., respectively; higher U_3O_8 and V_2O_5 content commands proportionately higher prices.

Vanadium Ore—$1.50 per lb. of V_2O_5 (guaranteed minimum of 18 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 3c. per lb.

[1]**Zirkite**—According to conditions, $70@$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Jan. 8—Zinc blende, per ton, high $36.85; basis 60 per cent zinc, premium, $29; Prime Western $27.50@$29; average selling price, all blende ores, $33.88. No sales of calamine.

Lead, high, $57.20; basis 80 per cent lead, $55@$47.50; average settling price, all grades of lead, $49.64 per ton. A few settlements are being made on ore sold on $50@$55 basis, but the buying basis is $47.50 this week.

Shipments for the week: Blende, 6,186; lead, 491 tons. Value, all ores the week, $234,040.

Efforts to buy ore on $25 basis at the close of 1920 proved futile; the closing price for Prime Western was $27.50. Blende opened this week stronger on $27.50 basis, and a few bins were bid $28.50 and one $29, the same price as premium grade. Sellers consider this a hopeful and helpful indication. There is more ore for sale, but it is being held for a $30 basis. The purchase this week was 8,300 tons, 4,500 tons larger than last week, and was approximately 2,000 tons in excess of the production, another very encouraging feature.

Platteville, Wis., Jan. 8—No market demand for lead or zinc. Shipments for the week: Zinc ore, 396; lead, 110 tons. Shipped during the week to separating plants, 1,680 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1 $2,000@$3,500; No. 2, $1,400@$2,000; spinning fibres, $400@$1,000; magnesia and compressed sheet fibres, $325@$500; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $23; ground (white), $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, first grade, $10 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—English, extra light, 5@5½c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $8@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$35, f.o.b. New York.

Feldspar—Crude, $8@$14 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $27@$30, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $25.50, f.o.b. Kentucky; ground, suitable for acid, chem-

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

ical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M. In Canada 85 per cent calcium fluoride sells for $20 per ton, f.o.b. Madoc; output limited. Canadian price generally $18 (Canadian currency) per ton, f.o.b. mines.

Fuller's Earth—$16 per ton, carload lots, f.o.b. New York.

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade, 7@9c. Lubricating grade commanding the best price is a fine flake, passing a 100@120 mesh, and running higher than 96 per cent carbon. Linotype machines use a flake passing 90 mesh and standing on a 120 screen, with 90 per cent carbon, retailing at 75c. to $1 per lb. and selling to jobbers at 11@40c.

Gypsum—Plaster of paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, $3.50@$4.50; calcined stucco, $9; f.o.b. works, Illinois.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. In Chicago district, $57.70; Atlantic seaboard, $61@$63.

Dead-Burned — $38 per net ton, Chewelah, Wash.; $58@$64, Chester, Pa. Austrian grade, $55@$60 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica, slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $1.75; No. 4, $3.25; No. 3, $5; No. 2, $6.50; No. 1, $8; A1, $10; extra large, $25; all f.o.b. New York; ground, $150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45 @$50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $150 @$170 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1½-in. disks, No. 1, $1.40 per lb.; No. 2, $1.25. The foregoing domestic prices obtain also in the Chicago district.

[1]**Monazite**—Minimum of 6 per cent thorium oxide, quoted $30 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. Finely ground Tennessee rock sells for $8.50 per net ton for 13 per cent phosphorus content, agricultural application; for acid-making, 14 per cent, $9; both prices f.o.b. Centerville, Tenn.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 16½c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1½ to 2 in., $14; rice, $17; all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike, Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4. St. Louis, open market, at $3.50; contract price on large quantities, $2.50; on small quantities, $3.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc—Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18; all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $50 @$60; Canadian, $20@$40 per ton.

Mineral Products

Arsenic — White arsenic, 11½@12c. per lb.; sulphide, powdered, 15@15½c. per lb. in carload lots.

Sodium Nitrate—$3 per cwt. ex vessel, Atlantic ports. Market quiet.

Sodium Sulphate—For 95 per cent material, $22 per ton, f.o.b. mines, Idaho and Arizona, spot and six months' contract.

Potassium Sulphate—Domestic, $225 @$250 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$225 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 16@17c. per lb. of chromium contained; 4 to 6 per cent carbon, 17@18c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, $110, f.o.b. seaboard bases; resale, $115; English, $110, c.i.f. Atlantic seaports. Spiegeleisen, 18@20 per cent, $50.50, f.o.b. furnace.

[1]**Ferromolybdenum**—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $55@$60; 50 per cent, $78@$80; 75 per cent, $140@$145.

[1]**Ferrotungsten**—Domestic, 70 to 80 per cent W, 55@60c. per lb. of contained tungsten, f.o.b. works. Foreign, 60c.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

[1]**Ferrovanadium**—Basis 30 to 40 per cent, $6@$6.50 per lb. of V contained, according to silicon content, f.o.b. works.

Metal Products

Copper Sheets—Current New York list price, 21½c. per lb.; wire, 15¾.

Lead Sheets—Full lead sheets, 8½c.; cut lead sheets, 8¾c. in quantity, mill lots.

Nickel Silver—34½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 19¾c.; sheathing, 19¾c.; rods, ⅝ to 3 in., 16¾c.

Zinc Sheets—$11.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 10c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $50@$55 per net ton, and $60 in sacks, carload lots, f.o.b. eastern shipping points.

Chrome Brick—Straights, $80 per net ton, shipping point; arches, keys, wedges, $85; splits, soaps, $100.

Fire Brick—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@ $50.

Magnesite Brick — 9-in. straights, $100 per net ton; 9-in. arches, wedges and keys, $105; soaps and splits, $120.

Silica Brick—9-in., per 1,000: Chicago district, $65@$70; Birmingham, Ala., $56@$61; Mount Union, Pa., $50 @$60.

Iron Trade Review

Pittsburgh, Jan. 11, 1921

On the whole, there seems to be a slight improvement in demand for steel products, but it is inconsequential, the market remaining extremely dull. Predictions are confidently made that there will be a distinct improvement in March, and that is in line with precedents, as the market frequently broadens in March.

The Steel Corporation's unfilled obligations decreased during December by 873,359 tons, against a November decrease of 815,371 tons. Shipments were about 94 per cent of capacity.

Pig Iron—The market remains absolutely stagnant, with more than half the merchant furnaces idle and many of those operating expecting to blow out soon. The market remains quotable at $32 for bessemer and malleable, $30 for basic, and $33 for foundry, f.o.b. Valley furnaces.

Semi-finished Steel—Mills quote sheet bars at $47, but buyers seem to expect to do $42 or $40. Billets are nominal at $43.50.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 5½c. per lb., in 250-lb. bbls. Barrel charge is 35c. additional.

Connellsville — Furnace, $6.25@$7; foundry, $5@$5.50.

Copper Prices, Production, and Exports

Rapid Decline in the Metal Comparable to the Drop That Occurred in 1907—December Production Figures Indicate Sharp Curtailment Has Begun—Export Trade, Although in Good Volume Early in 1920, Has Tapered Off

ON THE last day of 1920 copper dropped to the lowest price not only for the year, 12.125c. per lb., f.o.b. refinery, but also to a figure comparable only to extraordinary conditions in the industry. Thus, back in 1914 at the beginning of hostilities copper reached an unusually low limit—11.739c. per lb. was the average for November, —but the rapid rise from that low point is still fresh in the minds of most people interested in the copper market. The average price of New York electrolytic copper for ten years prior to 1911 is 14.759c. per lb. If 14⅜c. be judged a fair price for copper during that period, 12.75c. copper is certainly ridiculously cheap.

The most recent comparable decline in the price of copper is afforded by the record of the year 1907—a panic year and a year of depression. At that time the price dropped from an average monthly high of 25.065c. in May to 13.163c. in December. For the following four years the price held at relatively low levels, as the accompanying table indicates.

AVERAGE ANNUAL PRICE NEW YORK ELECTROLYTIC COPPER

In Cents per Pound

1907	20.004	1912	16.341	1917	27.180
1908	13.208	1913	15.269	1918	24.628
1909	12.982	1914	13.602	1919	18.691
1910	12.738	1915	17.275	1920	17.456
1911	12.376	1916	27.202		

In meeting the situation confronting them, it appears that copper producers have earnestly begun to drop their rate of production to a pre-war level or lower. December production reports bear this out. Thus, the largest producers have announced sharper decreases in production than any time during the year. The "porphyries" have taken a lead in the reduction, and together their output for December is lower than for November by more than 26 per cent. But they have not been alone in this movement. Inspiration, Miami, Anaconda, North Butte, and practically all producers have joined in the movement.

MID-YEAR AND YEAR-END COPPER PRODUCTION RATES,

In Pounds

	June, 1920	December, 1920
Anaconda	12,700,000	10,500,000
Utah	10,000,000	7,500,000
Phelps Dodge	6,125,000	5,850,000
Inspiration	7,300,000	5,000,000
Miami	4,400,000	4,373,123
Ray Consolidated	4,520,000	2,975,000
Chino	4,010,069	2,999,000
Nevada Consolidated	4,650,000	3,000,000
Calumet and Arizona	4,764,000	3,300,000

Although curtailment of production is a desirable condition, its effect does not extend alone to the decrease in copper output. Miners, millmen and others are thrown out of employment, with attendant discomfort and even hardship; railroads lose in revenue, and the mining companies cannot run at their most efficient rate. All of which is the cost of the depression in the industry. Nevertheless, the sooner there is complete readjustment to existing conditions the quicker will be the return to normal.

Despite the optimistic feeling in the copper trade at this time last year, due to phenomenally heavy buying of copper both in the United States and abroad, which was expected to make heavy inroads upon the copper surplus, the large unconsumed stocks of copper are still to be eliminated as a market depressant. Foreign trade in copper has been confidently expected to do its share in reducing the copper surplus, but the record for the year 1920 has been disappointing in that respect. A particularly promising start was made during the first six months of the year, when copper exports consistently overbalanced imports by about 145,000,000 lb. This record was not sustained by the second half of the year, for from July to November, inclusive, the export balance was only 14,200,000 lb.

The table presented below gives a detailed record of foreign trade in copper for the first eleven months of 1920, from which several important developments during the year are noted. First, there is shown the heavy exports of copper during the first few months of the year, greatly outweighing imports; then the transition to a smaller export balance, and finally the change to a preponderance of imports over exports—a highly unsatisfactory state of affairs. The November details of movements record a virtual balance of exports and imports, and although they indicate a marked improvement over the October trend, present an unsatisfactory comparison with copper movements of last spring.

The mainstays of foreign trade for copper during 1920 were France, the United Kingdom, Germany, and Japan. Asiatic purchases were heavy during the early months of the year, and contributed largely to a concurrent speculative rise in price, but are now no longer a factor in export trade. Sweden, an important copper-importing country earlier in the year, also dropped out of the market during the last half of 1920. Germany was a fairly consistent consumer of American copper, but imports were far below the pre-war rate of over 17,000,000 lb. monthly. There is little doubt that Germany is taking the smallest quantity of copper with which it is possible for her to get along, but as a potential consumer her abilities have not been touched.

Export trade as a whole has been unsatisfactory and not in the volume desirable to help remove the excess copper stocks, but, considering that copper is now much cheaper than it was when most of these export sales were made, it will be interesting to watch the foreign trade response that low copper prices should bring.

MOVEMENTS OF COPPER FROM AND TO THE UNITED STATES DURING PART OF 1920

In Pounds

EXPORTS

Refined copper in ingots, bars, etc., to:	January	February	March	April	May	June	July	August	September	October	November(a)
Belgium	.....	.....	.....	.....	.....	.....	536,638	2,978,454	2,803,913	1,040,990	1 861,441
France	6,077,254	4,031,308	7,203,950	10,889,955	17,803,625	11,315,461	17,797,752	14,633,149	4,659,360	5,531,926	12,987,092
Germany	.....	.....	10,661,454	14,003,294	7,055,336	11,415,403	5,634,824	4,808,472	1,536,105	3,263,094	6 347,098
Italy	.....	.....	43,655	56,018	81,364	289,213	56,002	112,285	.....	56 060	.....
Sweden	1,175,235	3,137,606	4,772,500	4,145,331	6,458,806	1,467,850	3,465,284	2,889,617	2,964,343	561,415	.....
Netherlands	.....	.....	.....	.....	.....	.....	191,463	2,327,411	840,505	1,063,357	3 350 232
Switzerland	.....	.....	.....	336,092	336,087	336,000	.....	.....	223,884	.....	.....
United Kingdom	8,524,942	5,294,208	12,439,106	8,798,829	14,810,044	11,018,402	9,200,750	6,828,152	3,326,631	4,423,793	4 738 717
Canada	2,355,664	3,983,327	4,861,385	2,210,644	3,877,894	2,140,139	1,523,997	2,961,718	2,264,481	1,084,171	1 424 510
Japan	10,428,250	15,580,964	32,037,044	9,024,552	9,184,000	4,417,980	940	.....	.....	.....	.....
Others	14,485,349	20,771,324	10,247,865	8,647,766	12,500,421	9,037,875	1,643,973	1,510,977	508,921	2 245 975	3 786 940
Wire, sheets etc	6,637,464	4,796,323	5,767,849	6,282,408	10,684,238	6,547,666	6,817,565	6,808,931	5,327,308	4,031,083	4 064 993
Total	49,684,158	57,595,060	88,034,808	64,394,889	82,791,815	57,985,989	46,869,188	45,859,166	24,455,451	23,301,864	38,561 023
Monthly average export price (c)	20.6c.	20.4c.	19.7c.	19.7c.	19.6c.	19.8c.	19.8c.	20.0c.	19.7c.	19.5c.	.....

IMPORTS

Ore, concentrates, matte, unrefined and refined copper wire, etc. (b)											
Total	37,962,874	45,227,401	39,144,137	27,811,572	53,860,911	51,530,407	30,491,424	31,360,881	30,561,643	34,187,265	38 291,788

(a) Preliminary estimate.

(b) Total copper content, mainly material shipped to the United States for refining by Canada, Mexico, Chile, and Peru.

(c) Based on the actual cost or the value of the articles at the time of exportation at the ports from which shipped.

COMPANY REPORTS

Yukon Gold Reports Tin Activities

Tin; Federated Malay States

The Yukon Gold Co. in a special report calls attention to its fine mining activities in the Federated Malay States. The government has control of all mining lands. Titles in perpetuity are not granted, but all lands are taken up on mining lease for twenty-one-year periods. If the requirements are met, the lease may be renewed when it expires. The mining regulations are fair and just. The government encourages large mining operations. There is a duty on all tin ore based on the gross value of 72 per cent concentrate. This varies from 12 per cent to 14 per cent, according to the price of the metal. Labor consists chiefly of Chinese coolies and Tamils. Wages paid range from 50c. to $1.75 per day, the latter being for mechanics and other skilled labor.

Local coal is available for steam plants, and there are mountain streams suitable for hydro-electric developments, which engineers are now investigating.

The use of tin has increased enormously in the arts and the manufacture of preservative containers. Viewing the situation from the possible tin that will be produced, and the increasing demand, it is reasonable to expect that the average price of tin at Singapore will exceed 45c. and will probably average 50c. per lb. for many years to come, says the report.

It has been estimated by drilling that the property, consisting of 2,182 acres, contains 126,127,000 cu.yd. with a metallic tin content of 75,115,000 lb. Returns are estimated as follows:

	With Tin at 40c. per Lb. at Singapore	With Tin at 45c. per Lb. at Singapore	Lb. Metallic Tin 75,115,000 With Tin at 50c. per Lb. at Singapore
Gross value of tin	$30,046,000	$33,801,750	$37,557,500
Cost of producing and marketing, including mining, freight, smelting, and export duty (a)	15,023,000	15,706,750	16,337,500
Operating profit	$15,023,000	$18,095,000	$21,220,000
Less royalties and outside interests	768,000	915,000	1,100,000
Net returns	$14,255,000	$17,180,000	$20,120,000
Total investment, property and equipment	3,670,000	3,670,000	3,670,000
Net over return of investment, in fifteen years	$10,585,000	$13,510,000	$16,450,000

(a) The cost per pound of tin produced increases from 20c. with tin selling at 40c. per lb. Singapore, to 21.75c. with tin selling at 50c. per lb., on account of duty increasing with price of tin.

It is proposed to equip the properties with power plants and seven dredges, or their equivalent in capacity, and it will require fifteen years to work out the properties with this equipment. The average capacity per dredge per year will be 1,200,000 cu.yd.

If the remaining unprospected areas under option in the above projects continue to develop at the present rate, an additional area equivalent to about 50 per cent of the present selected area should be added. It is expected that this additional area will warrant increasing the equipment to eleven dredges, which will return an operating profit, with tin at 45c. per lb., of $27,500,000 in fifteen years, or a net, after deducting cost of property and equipment, royalties, and other charges, of $22,000,000. With the full equipment the output should be about 450,000 lb. of tin per month.

Dredges are successfully working the Malayan tin deposits. Dredging costs vary in different parts of the field, but, without depreciation, range around 7c. per cu.yd. Dredging has shown that areas worked over by hand methods, besides virgin lands, can be dredged with good returns. The records of some of the dredging companies show that dividends of 25 per cent per year were paid from the dredging of ground averaging 0.50 lb. of tin ore per cu.yd. and with tin selling at 40c. per lb. at Singapore.

Extensive areas remain which cannot be worked by present methods, but should prove profitable for dredging. It is believed that dredging will soon be the controlling factor in the tin production of Malaya.

The company has both dredge and power-plant equipments immediately available, which, with certain alterations, are suitable for equipping the Malayan properties. It has also built up in the last fifteen years a staff and dredge organization with experienced men in every department, which can be transferred to the Malayan operations.

The projects so far developed show a large profit to be gained by dredging. Additional acreage is being developed each month, and the possibilities for extensive expansion are excellent.

McIntyre Porcupine Mines Increase Operating Profit

Gold; Ontario

The eighth annual report of the McIntyre Porcupine Mines, Ltd., indicates that an operating profit of $1,051,404.13, and a non-operating profit of $228,828.24, making a total of $1,280,232.37, was earned during the fiscal year ended June 30, 1920, as compared with $839,588.62 for the previous year. During the year, 188,835 tons of ore was treated, having an average value of $11.52. Bullion containing 99,461.39 oz. gold and 21,140.3 silver was recovered. Three dividends of 5 per cent each, aggregating $546,042.45, were paid to shareholders.

The result of the limited amount of development work accomplished, owing to the scarcity of labor, has been satisfactory. After producing $2,080,178.44, the ore reserves have been increased approximately one million dollars over the previous year's estimate.

Recent drilling has indicated the existence of a new vein system paralleling No. 5 vein, 480 ft. to the south, below the 1,000-ft. level. The intersections show good widths of better than the average grade ore, and, being on the north contact of the quartz porphyry, considerable importance is attached to this discovery. Profit and loss statement follows:

Earnings:		
Bullion recovery		$2,080,178.44
Bullion recovery custom ore	$53,689.09	
Payments for custom ore	53,689.09	
Treatment charges custom ore		6,887.00
Gross operating earnings		$2,087,065.44
Operating costs:		
Mining, development, and exploration	$582,676.27	
Transportation of ore	42,926.88	
Milling	197,317.14	
Heating and maintenance of building and camps	44,071.69	
Employees' insurance and welfare	33,503.36	
	$900,495.34	
Administrative and general expenses:		
Management and general expense, mine office	52,454.05	
Administrative and general expense—head office	63,619.70	
Insurance, general	19,092.22	
	$135,165.97	
Total operating costs		1,035,661.31
Net operating earnings		$1,051,404.13
Non-operating revenues:		
Interest and exchange earned	$221,838.05	
Miscellaneous earnings	6,990.19	
		228,828.24
Net earnings		$1,280,232.37
Appropriations:		
Reserve for municipal, provincial and dominion taxes for current year	52,569.98	
Reserve for plant depreciation	180,213.76	
Depreciation on Victory bonds, 1934, cost $500,000, present market value $475,000	25,000.00	
Holdings in adjoining mining properties written down to $1—written off	204,427.80	
Total appropriations		462,211.54
Net profit for the year, transferred to surplus		$818,020.83

MINING STOCKS

Week Ended January 8, 1921

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston	....	....	*60		
Ahmeek	Boston	52	46	52	Sept.'20,Q	.50
Alaska-B.C.	N. Y. Curb.	¼	⅛	⅛		
Alloues	Boston	21	17½	21	Mar.'19,	1.00
Anaconda	N. Y.	38⅛	33½	38	Nov. '20, Q	1.00
Ariz. Com'l	Boston	9	6½	8½	Oct. '18,	.50
Big Ledge	N. Y. Curb.	⅜	1/16	⅜		
Bingham Mines	Boston	....	....	9½	Sept. '19, Q	.25
Calumet & Aris.	Boston	50½	40½	50	Dec.'20, Q	1.00
Calumet & Hecla	Boston	259	240	250	June '20, Q	5.00
Canada Copper	N. Y. Curb.	....	....	*13		
Centennial	Boston	7	7	7	Dec. '18, SA	1.00
Cerro de Pasco	N. Y.	31½	27	30⅛	Dec. '20, Q	1.00
Chief Consol	Boston Curb	3	2⅛	2⅛	Nov. '20, Q	.10
Chile Copper	N. Y.	12⅛	9¼	11⅛		
Chino	N. Y.	23	19⅛	21⅛	Sept. '20, Q	.37½
Columbus Rexall	Salt Lake	*35½	*34	*35		
Con. Aris.	N. Y. Curb.	....	....	1/16	Dec. '18, Q	.05
Con. Copper M.	N. Y. Curb.	2⅛	1½	2¼		
Copper Range	Boston	32	27	31⅛	Sept. '20, Q	.50
Crystal Copper (new)	Boston Curb	*38	*34	*35		
Davis-Daly	Boston	7⅛	5½	7½	Mar. '20, Q	.25
East Butte	Boston	10	7⅛	10	Dec. '19, A	.50
First Nat'l	Boston Curb	*85	*65	*80	Feb. '19, SA	.15
Franklin	Boston	3½	2½	3		
Gadsden Copper	N. Y. Curb.	....	....	*25		
Granby Consol.	N. Y.	23	20	23	May '19, Q	1.25
Greene-Cananea	N. Y.	23⅛	20	22⅛	Nov. '20, Q	.50
Hancock	Boston	3⅛	2	3⅛		
Houghton	Boston Curb	*50	*50	*50		
Howe Sound	N. Y. Curb.	....	....	2⅛	Oct. '20, Q	.05
Inspiration Con.	N. Y.	36⅛	31	36⅛	Oct. '20, Q	1.00
Iron Cap	Boston Curb	9⅛	6½	9⅛	Sept. '20, K	.25
Isle Royale	Boston	22½	16½	22½	Sept. '19, SA	.50
Kennecott	N. Y.	21	17⅞	20⅛	Dec. '20, Q	.50
Keweenaw	Boston	1⅛	1⅛	1⅛		
Lake Copper	Boston	2⅛	2	2⅛		
La Salle	Boston	....	....	1½		
Magma Chief	N. Y. Curb.	....	....	*21		
Magma Copper	N. Y. Curb.	20⅛	18	20⅛	Jan. '19, Q	.50
Majestic	Boston Curb	*11	*8	*8		
Mason Valley	Boston	1⅛	1⅛	1⅛		
Mass Consol.	Boston	3½	2½	3½	Nov. '17, Q	1.00
Mayflower-O.C.	Boston	5⅛	4	5		
Miami	N. Y.	19⅛	15⅛	18⅛	Nov. '20, Q	.50
Michigan	Boston	3	2⅛	3		
Mohawk	Boston	48	43½	46	Nov. '20, Q	1.00
Mother Lode (new)	N. Y. Curb.	5⅛	5	5⅛		
Nevada Con.	N. Y.	11⅛	9⅞	10⅞	Sept. '20, Q	.25
New Arcadian	Boston	....	....	2⅛		
New Baltic	Boston Curb	....	....	3		
New Cornelia	Boston	16	14½	16	Aug. '20,	.25
Nixon Nev.	N. Y. Curb.	....	....	*5		
North Butte	Boston	12	8⅛	11⅛	Oct. '18, Q	.25
North Lake	Boston	*50	*35	*50		
Ohio Copper	N. Y. Curb.	....	....	1/16		
Ojibway	Boston	1⅛	1⅛	1⅛		
Old Dominion	Boston	21	15⅛	20⅛	Dec. '18, Q	1.00
Osceola	Boston	30	24	29	June '20, Q	.50
Phelps Dodge	Open Mar.	†175	†150	....	Jan. '21, Q	2.50
Quincy	Boston	41	35½	40	Mar. '20, Q	1.00
Ray Con	N. Y.	14⅛	11⅛	13⅛	Dec. '20, Q	.25
Ray Hercules	Boston Curb	....	....	*50		
St. Mary's M. L.	Boston	34	28	33½	June '20, K	2.00
Seneca Copper	Boston	20	17½	20		
Shannon	Boston	1⅛	⅞	1⅛	Nov. '17, Q	.25
Shattuck Ariz.	N. Y.	6⅛	4⅛	6½	Jan. '20, Q	.25
South Lake	Boston	....	....	1		
South Utah	Boston	*15	*5	*12		
Superior Copper	Boston	4	3½	4	Apr. '17,	1.00
Superior & Boston	Boston	2	1½	2		
Tenn. C. & C.	N. Y.	9	7½	8⅛	May '18, I	1.00
Tuolumne	Boston	*55	*40	*50	May '13.	.10
United Verde Ex.	Boston Curb	28	23	27	Nov. '20, Q	.50
Utah Consol.	Boston	4	3½	4	Sept. '18,	.25
Utah Copper	N. Y.	55½	48⅛	54	Dec. '20, Q	1.50
Utah M. & T.	Boston	*150	*95	*150	Dec. '17,	.30
Victoria	Boston	1⅛	1⅛	1⅛		
Winona	Boston	*50	*35	*35		
Wolverine	Boston	12½	9½	11	Jan. '20, Q	.50
LEAD						
Hecla Mining	N. Y. Curb.	4½	3 11/16	4⅛	Dec. '20,QX	.15
St. Joseph Lead	N. Y.	12½	12	12½	Dec. '20,QX	.50
Stewart	Boston Curb	....	....	*6	Dec. '15,	.05
Utah Apex	Boston	3	2⅛	2⅛	Nov. '20, K	.25
ZINC						
Am. Z. L. & S.	N. Y.	9⅛	8⅛	9⅛	May '17,	1.00
Am. Z. L. & S. pf.	N. Y.	31½	31½	31½	Nov. '20, Q	1.50
Butte C. & Z.	N. Y.	6	4⅛	5⅛	June '18, I	.50
Butte & Superior	N. Y.	14⅛	10⅛	12⅛	Sept. '17,	1.25
Callahan Z. L.	N. Y.	7⅛	5⅛	7	Dec. '20, Q	.50
New Jersey Z.	N. Y. Curb.	135	130	135	Nov. '20, Q	4.00
Success	N. Y. Curb.	*3	*2	*2⅛	July '16,	.03
Yellow Pine	Los Angeles.	‡....	....	*45	June '20, Q	.03

Stock	Exch	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	1⅛	⅛	1⅛		
Alaska Juneau	N. Y.	1⅛	1	1⅛		
Carson Hill	N. Y. Curb.	....	....	22⅛		
Cresson Consol. G.	N. Y. Curb.	....	....	1½	June '20, Q	.10
Dome Ex.	Toronto	....	†*38	*41		
Dome Mines	N. Y.	12	10⅛	11⅛	Oct. '20, Q	.25
Golden Cycle	Colo. Sprgs.	‡....	....	*73	Dec. '20, Q	.02
Goldfield Con.	N. Y. Curb.	1/16	....	1/16	Dec. '19,	.05
Hedley	Boston	....	....	4⅛	June '19,	.10
Hollinger Con.	Toronto	5.75	5.55	5.75	Dec. '20, BM	.05
Homestake	N. Y.	50	50	50	Sept. '19,	.50
Kirkland Lake	Toronto	*40	*40	*40		
Lake Shore	Toronto	1.05	1.03	1.03	Oct. '20, K	.02
McIntyre-Porcupine	Toronto	1.83	1.80	1.83	Jan. '21, K	.05
Porcupine Crown	Toronto	*18	*17½	*18	July '17,	.03
Portland	Colo. Sprgs.	‡....	....	*60	Oct. '20, Q	.01½
Reorgan. Booth	N. Y. Curb.	*4½	*3	*3	May, '19,	.05
Silver Pick	N. Y. Curb.	*5	*4	*5		
Teck Hughes	Toronto	....	....	*10		
Tom Reed	Los Angeles.	‡....	....	1.22	Dec. '19,	.02
United Eastern	N. Y. Curb.	2½	2 1/16	2⅛	Oct. '20, Q	.15
Vindicator Consol.	Colo. Sprgs.	‡....	....	*18	Jan. '20, Q	.01
West Dome Consol.	Toronto	*9½	*7	*7		
White Caps Min.	N. Y. Curb.	*5	*4	*4½		
Yukon Gold	Boston Curb	....	....	*50	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*19	*18	*18	Apr. '20, M	.03
Beaver Con.	Toronto	*27	*26	*26	May '20, K	.03
Coniagas	Toronto	1.85	1.85	1.85	Nov. '20, Q	.12½
Crown Reserve	Toronto	....	....	*16	Jan. '17,	.05
Kerr Lake	Boston	....	....	2⅛	Oct. '20, K	.12½
La Rose	Toronto	*24	*24	*24	Apr. '18,	.02
McKinley-Dar.	Toronto	*25	*25	*25	Oct. '20, Q	.03
Mining Corp.	Toronto	1.00	1.00	0.98	Sept. '20, Q	.12½
Nipissing	N. Y. Curb.	7⅛	7⅛	7⅛	Oct. '20, QX	.50
Ontario Silver	N. Y.	5⅛	4⅛	5⅛	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb.	⅛	⅛	1/16	Jan. '12,	.10
Peterson Lake	Toronto	....	....	*9	Jan. '17,	.01½
Temiskaming	Toronto	....	....	*25	Jan. '20, K	.04
Trethewey	Toronto	*15½	*15½	*15½	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb.	*1⅛	*1	*1⅛		
Barnes-King	Butte	‡....	....	1.11	Aug. '20, Q	.05
Bost. & Mont.	Boston	....	....	*63		
Cashboy	N. Y. Curb.	*5	*3⅛	*4⅛		
El Salvador	N. Y. Curb.	⅛	1/16	⅛		
Jim Butler	N. Y. Curb.	*17⅛	*16	*17	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb.	*5⅛	*4	*5	June '16,	.05
Louisiana Con.	N. Y. Curb.	⅛	⅛	⅛		
MacNamara M.	N. Y. Curb.	1/16	1/16	1/16	May '10,	.02½
N.Y.-Hond. Rosar.	Open Mar.	†10½	†9	....	Oct. '20, QX	.50
Tonopah-Belmont	N. Y. Curb.	1⅛	1	1 1/16	Jan. '21, Q	.05
Tonopah-Divide	N. Y. Curb.	1 1/16	1 1/16	1 1/16		
Tonopah Ex.	N. Y. Curb.	1⅛	1 1/16	1 1/16	Jan. '21, Q	.05
Tonopah Mining	N. Y. Curb.	1 1/16	1 1/16	1 1/16	Oct. '20, SA	.05
West End Con.	N. Y. Curb.	1⅛	⅛	1⅛	Dec.'19, SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb.	*17	*15	*15	July '20, M	.01
Consol. M. & S.	Montreal	18	17½	18	Oct. '20, Q	.62½
Daly Mining	Salt Lake	1.95	1.95	1.95	July '20, Q	.10
Daly-West	Boston	3⅛	3⅛	3⅛	Dec. '20, Q	.25
Eagle & Blue Bell	Boston Curb	2⅛	1⅛	2⅛	Dec. '20, K	.25
Electric Point	Spokane	‡....	....	*5	May '20, SA	.03
Fed. M. & S.	N. Y.	....	....	7⅛	Jan. '09	1.50
Fed. M. & S. pf.	N. Y.	28⅛	23	28⅛	Dec. '20, Q	1.75
Florence Silver	Spokane	‡....	....	*14	Apr. '19,	.01½
Grand Central	Salt Lake	....	....	*37½	June '20, K	.03
Iron Blossom	N. Y. Curb.	1/16	*15½	*16	Apr. '20, Q	.02½
Judge M. & S.	Salt Lake	3.00	3.00	3.00	Sept. '20, Q	.12½
Marsh Mines	N. Y. Curb.	*9	*7⅛	*8		
Prince Consol.	N. Y. Curb.	1/16	⅛	1/16	Nov. '17,	.02½
Rambler-Cariboo	Spokane	‡....	....	*7⅛	Feb. '19,	.01
Rex Con.	N. Y. Curb.	*4	*4	*4		
South Hecla	Salt Lake	*65	*65	*65	Sept. '19, K	.15
Stand. S. L.	N. Y. Curb.	1/16	1/16	1/16	Oct. '17,	.05
Tamarack-Custer	Spokane	‡....	....	1.80	Dec. '19, K	.03
Tintic Standard	Salt Lake	3.42½	3.35	3.35	June '20, Q	.10
Wilbert Mining	N. Y. Curb.	*3	*2	*2⅛	Nov. '17,	.01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	16⅛	13⅛	15⅛	Mar. '19,	.50
Internat'l Nickel, pf.	N. Y.	75	75	75	Nov. '20, Q	1.50
QUICKSILVER						
New Idria	Boston	*95	*95	*95	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb	....	....	*5		
VANADIUM						
Vanadium Corp.	N. Y.	37⅛	32⅛	35⅛	Oct. '20, Q	1.50
ASBESTOS						
Asbestos Corp.	Montreal	79⅛	77	79⅛	Oct. '20, Q	1.50
Asbestos Corp. pf.	Montreal	90	88⅛	90	Oct. '20, Q	1.75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y.	39⅛	35	38	Dec. '20, Q	1.00
Am. S. & R. pf.	N. Y.	80⅛	75⅛	80⅛	Dec. '20, Q	1.75
Am. Sm. pf. A	N. Y.	64	64	64	Jan. '21, Q	1.50
U. S. Sm. R. & M.	N. Y.	35	33	34	Oct. '20, Q	1.50
U. S. S.R. & M. pf.	Boston	45	43½	44	Oct. '20, Q	.87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q. Quarterly SA, Semi-annually. BM, bi-monthly. K, Irregular. I, Initial. X, includes extra

CURRENT PRICES OF MATERIALS AND SUPPLIES

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	3.55	6.22½	4.68	7.95	$4.90	4.57
No. 12	3.60	6.27½	4.83	8.00	4.95	4.62
No. 14	3.65	6.32½	5.03	8.05	5.00	4.67
No. 16	3.75	6.42½	5.13	8.15	5.10	4.77
Black:						
*Nos. 18 and 20.	4.20	8.00	5.80	9.05	5.80	5.30
*Nos. 22 and 24.	4.25	8.05	5.85	9.10	5.85	5.35
*No. 26	4.30	8.10	5.90	9.15	5.90	5.40
*No. 28	4.35	8.20	6.00	9.25	6.00	5.50
Galvanized:						
No. 10	4.70	8.70	5.30	....	6.40	5.75
No. 12	4.80	8.80	5.40	9.85	6.50	5.85
No. 14	4.80	8.80	5.40	9.85	6.50	5.85
Nos. 18 and 20	5.10	9.10	5.70	10.15	6.75	6.15
Nos. 22 and 24	5.25	9.25	5.85	10.30	6.90	6.30
*No. 26	5.40	9.40	5.90	10.45	7.05	6.45
*No. 28	5.70	9.70	6.00	10.70	7.35	6.75

* For painted corrugated sheets, add 30c. per 1,000 lb. for 5 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets, add 15c., all gages.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, ⅝ in. and larger	$3.65	$3.35	$3.40	$5.47½	$7.75
Track bolts	5.50	4.35	4.60	6.45	8.75
Standard section angle bars	2.75	3.00	2.75	4.50	5.00

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill Pittsburgh	New York Current	New York 1 Year Ago	St. Louis	Chicago
Beams, 3 to 15 in.	$2.45	$3.80	$3.47	$3.67½	$3.97
Channels, 3 to 15 in.	2.45	3.80	3.47	3.67½	3.97
Angles, 3 to 6 in., ¼ in. thick	2.45	3.80	3.47	3.67½	3.97
Tees, 3 in. and larger	2.45	3.85	3.52	3.72½	4.02
Plates	2.65	4.00	3.67	3.87½	4.17

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$3.00	$4.00@$5.00	$2.55

RIVETS—The following quotations are per 100 lb:

	STRUCTURAL Mill Pittsburgh	Warehouse New York Current	New York One Yr. Ago	Chicago	St. Louis	San Francisco
½ in. and larger	$4.50	$5.73	$5.00	$5.08	$5.82½	$7.05
CONE HEAD BOILER						
½ in. and larger	$4.60	$6.00	$5.10	$5.18	$5.92½	$7.15
⅜ and 7/16	4.75	6.15	5.25	5.33	6.83	7.40
½ and 9/16	5.00	6.40	5.60	5.68	6.92½	7.60

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand special and cast steel	20%
Patent flattened strand iron rope	5%
Plow steel round strand rope	30%
Special steel round strand rope	30%
Cast steel round strand rope	22½%
Iron strand and iron tiller	5%
Galvanized iron rigging and guy rope	+12%

Chicago, +17½% on galvanized and on bright steel.

Western and California Territory
25%, plow steel; 22½% galv. iron rigging and guy rope.

Montana, Idaho and Arizona
20, plow steel, 27½%, galv. iron rigging and guy rope.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Denver	Chicago	St. Louis	Birmingham	Cincinnati
Straight	$5.75	$8.65	$7.00	$7.00	$7.25	$7.00
Assorted	5.85	8.90	7.15	7.15	....	....

BAR IRON AND STEEL—Per 100 lb. to large buyers at mill, Pittsburgh:

Iron bars..... $3.63 Steel bars..... $2.35

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver	Cincinnati
Solid	12@14c.	13c.	20c.	14½c.	18c
Hollow	17@20c.	...	...	21c.	...

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card:

BUTT WELD

Steel Inches	Steel Black	Steel Galv.	Iron Inches	Iron Black	Iron Galv.
⅛ to 3	54 to 57½	41½ to 44	⅛	15½ to 5½ +	1½ to 11½
			¼	19½ to 9½	1½ to 11½
			⅜ to 1½	24½ to 34½	8 to 18½

LAP WELD

2	47 to 50½	34½ to 38	2	20½ to 28½	6½ to 14½
2½ to 6	50 to 53½	37½ to 41	2½ to 6	22½ to 30½	9½ to 17½

BUTT WELD, EXTRA STRONG, PLAIN ENDS

2 to 3	53 to 56½	40½ to 44	⅛ to 1¼	24½ to 34½	9½ to 19½

LAP WELD, EXTRA STRONG, PLAIN ENDS

2	45 to 48½	33½ to 37	2	21½ to 29½	8½ to 16½
2½ to 4	48 to 51½	33½ to 40	2½ to 4	23½ to 31½	11½ to 31½
4½ to 6	47 to 50½	35½ to 39	4½ to 6	22½ to 30½	10½ to 18½
7 to 8	43 to 46½	29½ to 33	7 to 8	14½ to 22½	2½ to 10½
9 to 12	38 to 41½	24½ to 28	9 to 12	9½ to 17½	5½ to+2½

STEEL—From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Cleveland	Black Chicago
⅛ to 3 in. butt welded	38%	42%	57½%
3½ to 6 in. lap welded	33%	44%	53½%

	Galvanized New York	Galvanized Cleveland	Galvanized Chicago
⅛ to 3 in. butt welded	22%	39%	44%
3½ to 6 in. lap welded	18%	29%	41%

Malleable fittings, Class B and C, from New York stock sell at list plus 23%
Cast iron, standard sizes, net.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	+$1.25	$1.50	List	$2.25	+$1.15	$1.00
Hot pressed hexagon	+ 1.25	1.50	List	2.25	+ 1.15	0.85
Cold punched square	+ 1.25	1.50	List	2.25	+ 1.15	1.00
Cold punched hexagon	+ 1.25	1.50	List	2.25	+ 1.15	1.00

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	30%	50-10%
Chicago	40%	50%
Cleveland	50%	60-10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
¼ in. by 4 in. and smaller	35%	5%	40%
Larger and longer up to 1 in. by 30 in.	25%	4%	30%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For Wrought-iron washers:
New York.....$2.00 Cleveland.....$2.75 Chicago.....$2.50

For cast-iron washers the base price per 100 lb. is as follows:
New York.....$7.00 Cleveland.....$4.50 Chicago.....$5.50

CONSTRUCTION MATERIALS

PREPARED ROOFING—Standard grade rubbered surface, complete with nails and cement, costs per square as follows at manufacturing points:

	New York 1-Ply c.l.	New York 2-Ply l.c.l.	New York 3-Ply c.l.	Philadelphia 1-Ply c.l.	Philadelphia 2-Ply l.c.l.	Philadelphia 3-Ply c.l.
No. 1 grade	$2.05	$2.40	$2.80	$1.95	$2.30	$2.75
No. 2 grade	1.85	2.15	2.50	1.75	2.05	2.40

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $3.50 per roll in carload lots and $3.75 for smaller quantities.

Shingles, red and green slate finish, cost $8.00 per square in carloads; $8.25 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York:

Tar felt (14 lb. per square of 100 sq.ft.), per roll	$3.05
Tar pitch (in 400-lb. bbl.), per 100 lb.	2.25
Asphalt pitch (in barrels), per ton	56.50
Asphalt felt (light), per ton	122.00
Asphalt felt (heavy), per ton	122.00

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
Minneapolis	$0.121	$0.2117	$0.3314
Seattle	.13	.175	.30
Los Angeles	.10	.175	.....
Cincinnati	.20	.22	.....

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20-Ft. and Under				12 x 12-in. 20-Ft. and Under	
	P.	Fir	Hemlock	Spruce	P.	Fir
Boston	$60.00	$65.00	$52.00	$58.00	$76.00	$68.00
Kansas City	51.00	51.25	51.25	51.25	60.00	51.25
Seattle	.....	35.00	.....	.....	.....	35.00
New Orleans	38.00	.....	.....	.....	42.00	.....
Baltimore	70.00	.....	.....	.....	80.00	.....
Cincinnati	37.50	38.00	50.00	50.00	55.00	40.00
Montreal	80.00	80.00	70.00	80.00	79.00*	100.00
Los Angeles	.....	57.00	.....	.....	.....	59.00
Detroit	57.00	77.50	.....	.....	67.25	67.25
Denver	.....	42.75	.....	.....	.....	42.75

	1-In. Rough, 10-In. x 16-Ft. and under			2-In. T. and Gr. 10-In. x 16 Ft.	
	P.	Fir	Hemlock	P.	Fir
Boston	$62.00	$74.00	$45.00	$63.00	$78.00
Kansas City	102.00	106.50	106.50	113.00	112.75
Seattle	.....	27.50	.....	.....	25.00
New Orleans	65.00	.....	.....	38.00	.....
Baltimore (box)	50@52.50	.....	.....	50@55	.....
Cincinnati	34.00	47.50	43.00	35.00	64.00
Montreal	77.00	78.00	70.00	85.00	85.00
Los Angeles	.....	58.00	.....	.....	.....
Detroit	43.00	47.50	43.00	.....	44.00
Denver	.....	37.75	.....	.....	33.25

*Montreal—Up to 22 ft.; over which, $3.00 per M. increase up to 30 ft.

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	Denver	Chicago	San Francisco
Wire	$3.25	$5.50	$4.15	$6.00

PORTLAND CEMENT—These prices are for barrels in carload lots, *without bags.*

	Current	One Month Ago	One Year Ago
New York (delivered)	$3.50	$3.80	$2.80
Jersey City (delivered)	3.20	3.20	2.47
Chicago	2.37	2.35	2.00
Pittsburgh	2.42	2.42	2.05
Cleveland	2.73	2.73	2.32
Denver	3.25	3.25	3.12
Los Angeles	3.10	3.10	2.78
San Francisco	3.09	3.09	2.43

NOTE—Charge for bags is generally 25c. each, $1 per bbl.

LIME—Warehouse prices:

	Hydrated per Ton— Finished	Common	Lump per 200-lb. Barrel— Finished	Common
New York	$21.00	$20.00	3.80* at plant	$3.60*
Kansas City	27.20	26.20	2.50	2.40
Chicago	.....	.....	....	1.65
St. Louis	27.00	21.00	....	2.50
San Francisco	25.40	22.00	....	2.25
Minneapolis	29.50	23.00	2.00†	1.85†
Denver	32.00	.....	1.05 (bu.)	....

NOTE—Refund of 10c. per barrel, with 25c. per ton off on hydrated.
*300-lb. barrels. †180-lb. barrels.

LINSEED OIL—These prices are per gallon:

	New York Current	New York Year Ago	Chicago Current	Chicago Year Ago
Raw per barrel (5 bbl. lots)	$0.83	$2.15	$0.97	$2.37
5-gal. cans	0.90	2.30	1.22	2.57
1-gal. cans	1.05	.....	....	....

WHITE AND RED LEADS—500-lb. lots sell as follows in cents per pound:

	Red Current		Red One Year Ago		White Current Dry and In Oil	White 1 Year Ago Dry and In Oil
	Dry	In Oil	Dry	In Oil		
100-lb kegs	14.25	15.75	13.00	14.50	14.25	13.00
25-and 50-lb. kegs	14.50	16.00	13.25	14.75	14.50	13.25
12½-lb. kegs	14.75	16.25	13.50	15.00	14.75	13.50
5-lb. cans	17.25	18.75	15.00	16.50	17.25	15.00
1-lb. cans	19.25	20.75	16.00	17.50	19.25	16.00

MINING AND MILLING SUPPLIES

HOSE—

FIRE	50-Ft. Lengths
Underwriters' 2½ in.	$0.75 per ft.
Common, 2½-in.	40%

AIR

	First Grade	Second Grade	Third Grade
¾-in. per ft.	$0.50	$0.35	$0.25

STEAM — DISCOUNTS FROM LIST

First grade.....30% Second grade.....45% Third grade....50–10%

LEATHER BELTING—Present discounts from fair quantities (½ doz. rolls):

Light Grade	Medium Grade	Heavy Grade
30-10%	30%	25%

RAWHIDE LACING—For cut, best grade, 35%, 2d grade, 40%. For laces in sides, 63c. per sq.ft.; 2d, 62c. For semi-tanned; cut: 25%; sides, 65c. per sq.ft.

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to $0.02 extra while for quantities amounting to less than 600 ft. there is an extra charge of $0.01. The number of feet per pound for the various sizes is as follows: ¾-in. 8 ft., ⅞ in., 6; 1-in., 4½; 1-in., 1¼-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ¾ in. and larger, in 1200-ft. coils:

New York	$0.25	Kansas City	$0.29
Cincinnati	0.32	Seattle	0.28
Chicago	0.27½	St. Louis	0.26½
Minneapolis	0.27¾	Denver	0.28½
San Francisco	0.25	Los Angeles	0.28

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$1.00
Asbestos for high-pressure steam	2.00
Duck and rubber for piston packing	1.20
Flax, regular	1.20
Flax, waterproofed	1.70
Compressed asbestos sheet	1.00
Wire insertion asbestos sheet	1.50
Rubber sheet	.50
Rubber sheet, wire insertion	.70
Rubber sheet, duck insertion	.60
Rubber sheet, cloth insertion	.30
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.50
Asbestos wick, ½- and 1-lb. balls	1.10

RAILWAY TIES—For fair size orders the following prices per tie hold:

Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago—Plain	$1.85	$2.00
Chicago—Creosoted	2.20	2.25
San Francisco—Douglas fir, green	1.35	.96
San Francisco—Douglas fir, creosoted	2.50	1.92

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.80	No. 1	$0.60
No. 2	.90	No. 2	.70
No. 3	1.00	No. 3	.80
No. 4	1.25		

FLOTATION OILS—Prices of oils for flotation, in cents per gal. in bbls.:

	New York	Chicago In. Bbl.	Chicago Carloads
Pure steam-distilled pine oil, sp.gr. 0.93-0.94	$1.75	$1.90	$1.85
Pure destructively distilled pine oil	1.65	1.90	1.85
Pine tar oil, sp.gr. 1.025-1.035	.48	.34	.32
Crude turpentine, sp.gr. 0.900-0.970	.70	1.30	1.17
Hardwood creosote, sp.gr. 0.96-0.99*	.35	....	....

*F.o.b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York Current	New York One Year Ago	Cleveland	Chicago
White	11.00–15.50	13.00	15.00	11.00–14.00
Colored mixed	7.00–10.50	9.00–12.00	11.00	9.50–12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x13½
Cleveland	$55.00	$65.00
Chicago	41.00	43.50

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York	.....	$0.3325	$0.3625	.....	$2.80
Kansas City	$0.2475	.27	.30	.34	2.40
Seattle	.18	.205	.225	.29½	2.60
Chicago	.2225	.2425	.2675	.335	2.50
Minneapolis	.2222	.2426	.2682	.....	2.80
St. Louis	.245	.28	.315	.3575	2.50
Denver	.2250	.2550	.29	.3325	2.70
Los Angeles	.22	.27	.31	.....	2.95
Atlanta	.2575	.2925	.3225	.3650	2.55
Cincinnati	.2275	.2625	.2925	.3575	2.30
Montreal	.30	.32	.37	.38	4.10

CHEMICALS

SODIUM CYANIDE—New York price is 22@30c. per lb.; Chicago, 30c.; St. Louis, 34c.; Birmingham, 45c.; Denver, 36c.

SODIUM SULPHIDE—New York price per pound is 6½c.@7c. for concentrated. Chicago, 5c. for concentrated, 3½c. for crystals. Denver price is 6c. for crystals. St. Louis, concentrated, 10½c., crystals, 11c. Concentrated comes in 500-lb. drums, crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 12@13c. per lb.; Chicago, 12½c.

ALUMINUM DUST—Chicago price is $1.10 per lb.; Birmingham, $1.52.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points:

	Union 100-Lb. Drums	Cameo 100-Lb. Drums	Union Single 25-Lb. Drums
East of the Mississippi, north of Chattanooga	$6.25	$6.00	$1.56

In the other zones the increase is proportionate to the increase in freights.